

Stewart Port of Entry Redevelopment  
Project # R.071365.001

## APPENDIX A – BUILDING REQUIREMENTS



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## 2.0 GENERAL REQUIREMENTS

### 2.1. CODES, STANDARDS AND AUTHORITIES

- 2.1.1. The design and construction shall be in accordance with all applicable codes, standards and authorities having jurisdiction, including CSA B651, Accessible Design for the Built Environment, along with those listed in the Performance Specifications. In the event of conflict between these, the most stringent requirements shall apply.
- 2.1.2. Design, review and submit Letter of Assurances in accordance with BCBC Division C Part 2.2.7 as if the project is submitting for local permits.
- 2.1.3. Due to geographical constraints and short construction period, the buildings shall be prefabricated and certified to CSA A-277 – Procedure for Factory Certification of Buildings. Other building construction methods to reduce onsite construction duration such as Structural Insulated Panels maybe permitted upon written permission by Departmental Representative.

### 2.2. DESIGN AND CONSTRUCTION DOCUMENTATION

#### 2.2.1. Definitions

- (a) Building Information Modeling (BIM)
  - (1) A process involving the generation and management of digital representations of physical and functional characteristics of a facility.
  - (2) Resulting integrated project models become shared knowledge resources to support decision-making about a facility throughout the project life cycle including design and construction and its operational life and eventual demolition.
  - (3) BIM also facilitates exchange and interoperability of information in digital format
- (b) BIM Model Manager(s)
  - (1) Manager with sufficient BIM experience for the size and complexity of the project and relevant proficiency in the proposed BIM authoring and coordination software.
  - (2) Serve as the project team, including PWGSC, main point of contact for BIM related issues.
- (c) Electronic O&M Data/Manual
  - (1) Electronic based operation and maintenance manual tracking, and project closeout punch lists.
  - (2) PDF and Word format interactive point in time document and data base, complete with an Excel format asset register data ready for PWGSC reserved Facility Management software.
  - (3) Stand alone and/or website based.
  - (4) Export asset data from the BIM using Excel or IFC files.
  - (5) Online internet interface for data asset input.
  - (6) Track commissioning performance results associated with component, systems and integrated systems testing and compare progress with a Commissioning Plan schedule and activities.
- (d) Level of Development (LOD)

- (1) Level of Development (LOD) for each model element on the model content criteria established by the AIA Document E-202, Building Information Modeling protocol Exhibit.
- (2) Each LOD is built on the previous LOD.

Level of Development	Description
LOD 100 Schematic Design	The LOD 100 model to consist of overall building massing designed to perform whole building type analysis including building massing indicative of area, height, volume, location and orientation, square meter costs and capable to support project scheduling, phasing and duration. LOD 100 also pertains to 2D representation of elements as required by the 2D Construction Documents which may include drawings, narratives, and hand-built models.
LOD 200 Design Development	Model to consist of generalized systems including approximate quantities, sizes, shapes, location, and orientation. The LOD 200 mode(s) are used for analysis of defined systems and general performance objectives. LOD 200 model(s) include attributes and parameters defined in the Contractor's BIM PLAN, as reviewed and accepted by in the PWGSC.
LOD 300 Construction Documentation	Model to include elements equivalent to traditional construction documents and shop drawings. LOD 300 models support a detailed model development of systems supporting building occupancy, facility management, estimating, construction coordination for clash detection, scheduling, and visualization. LOD 300 model(s) include attributes and parameters defined in the Contractor's BIM PLAN, as reviewed and accepted by in the PWGSC.
LOD 400 Construction Administration/ Shop Drawings	Model elements to be modeled as specific assemblies which are accurate in terms of quantity, size, shape, location, orientation and support highly detailed logistical, scheduling, and estimating efforts.. LOD 400 model(s) to be virtual representations of the proposed elements and to be considered suitable for construction, fabrication, assembly and including MEP systems.
LOD 500 Project Completion/ Record Drawings/ As-Built Conditions	Model elements represent the project as it has been constructed, including as-built conditions. Configure model to the central data storage for integration into an automated process for facility management and data extraction from the BIM into Canada's Computerized Maintenance Management Systems such as NMMS and VFA. It may involve using MS Excel, MS Access or the IFC files to develop the integration and the Electronic O&M Data/Manual. LOD 500 Model(s) include completed parameters and attributes specified in the Project Requirements document, the BIM Plan and other documents as applicable and required. At the completion of construction, the BIM model(s) will be finalized, linked, and cross referenced.

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LOD additional  
500 Series  
Reserved

PWGSC reserved. Other LOD model elements will not be generated during the project.

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### 2.2.1. General Requirements

- (a) The Contractor shall provide comprehensive architectural and engineering services throughout the project phases through a single Professional of Record.
- (b) Conceptual Drawings provided in the Appendices are conceptual in nature. Contractor shall provide design in compliance with criteria defined in the performance specifications. Any discrepancies shall be brought to the attention of Departmental Representative.
- (c) Prepare drawings and specifications for all phases by all consultants using BIM process. AutoCAD files containing the Conceptual Design will be provided to the Contractor; however, Canada will take no responsibility for the accuracy of information provided and the file shall be used at the Contractor's discretion.
  - (1) All materials and files produced in the project including the original BIM file will become property of Canada. Contractor shall provide all original files to Canada. Contractor will consent to Canada the right to use the design of Stewart Port of Entry in part or in whole for other Port of Entries and compensation for which shall be included in the contract price.
  - (2) Revisions to drawings and specifications and additional design requested by Canada during Schematic Design, Design Development or Design Review are not "changes". They will be completed at Contractor's cost unless otherwise agreed by both parties.
- (d) Prepare specifications in National Master Specifications (NMS) 3-Part format, conforming to the new numbering system of the current Master Format and integrating with BIM. The specifications included in this and other sections following are not to be reused as a basis for the construction portion of the Work, but may be expanded upon in the development of the Contractor's construction specifications, and must include all required information as to materials, installation, etc.
- (e) The Issued for Construction Documents must be signed and sealed by the appropriate professional discipline responsible for the design. Design professionals must be licensed to practice in the Province of British Columbia. Submit Schedules as per part 2.7 of the BCBC.
- (f) Construction may not proceed for any portion of work until all pertinent Construction Documents have been reviewed and signed off by the Departmental Representative.

### 2.2.2. Contractor

- (a) Implement the BIM process in connection with all design, engineering, coordination, commissioning, construction and closeout of the Project.
- (b) Provide all design and engineering of the Project in one integrated BIM model.
- (c) All materials and files produced in the project including the original BIM files will become property of Canada with the right to use the design of Stewart Port of Entry on other Port of Entries without additional compensation.
  - (1) Commissioning (Cx)

- (A) Up to date BIM definitions and elements made available to the Cx team to review and export out information to include the data in Electronic O&M Manual.
- (2) Electronic O&M Data/Manual

### 2.2.3. Scope and Activities

- (a) Identify how the BIM will integrate throughout the project life cycle and including closeout documents.
- (b) The content for the LOD is described in the Definition section.
- (c) Prepare as-built drawings in accordance to PWGSC National CADD Standards. The CADD Standard can be access on the internet at the following URL:
  - (1) <http://www.tpsgc-pwgsc.gc.ca/biens-property/cdao-cadd/anna10-eng.html>
- (d) Identify the Level of Detail (LOD) in the various phases of the project and demonstrate how shop drawings will be incorporated into the model.
- (e) Provide clash analysis as this is an important benefit of BIM.
- (f) Incorporate structural and energy load analysis into the BIM model.
- (g) Incorporate scheduling into the BIM model.

### 2.2.4. Deliverables

- (a) Prepare drawings for all phase using BIM process and BIM tools in order to enable PWGSC to leverage facility data created throughout the design and construction process.
- (b) Models.
  - (1) Ensure models remain current throughout design and construction.
  - (2) Coordinate separate technical discipline models.
  - (3) Include record models for all building systems.
- (c) Provide a Clash Detection report file.
- (d) At project closeout, in addition to providing the BIM (model) created throughout the design and construction process, the Consultant Team will be required to submit as-built drawings in CADD and specifications as detailed in the Project Closeout.
- (e) Provide an interoperable file format for final as-built model to meet IFC (2x3) exported file and COBie data requirements to support operations, maintenance and asset management once the buildings are in service.
- (f) As-built BIM (model) to LOD500 level.
  - (1) Produce printed and electronic sets of final documents (such as drawings, specifications, commissioning reports and O&M manuals.
- (g) Electronic O&M Manual, include items such as:
  - (1) Asset records describing items of equipment, assets and elements of work.
  - (2) Maintenance document related to schedule and required tasks.
  - (3) Operations documents relevant to operations of systems, equipment and assets including start-up and shutdown.
  - (4) Warranties, guaranties and certificates
    - (A) Detail those documents extending beyond one (1) year.
  - (5) Commissioning

- (A) Test results, performance criteria and baseline operations statistics associated with design expectations and manufacturer performance data sheets.
- (6) Spare Parts
  - (A) Listing as per technical specifications.
- (7) Help contact information.
- (8) Recorded Training sessions.
- (9) Addition drawings and references.
  - (A) Uncategorized information.
- (10) Project Record (As-Built) documentation.
- (11) Compressed Files
  - (A) Complete with full description of all contained files.
- (12) Digital Information
  - (A) Submit electronically through an agreed upon electronic portal with data organized and software versions labelled.
- (13) BIM Deliverables Schedule (not withstanding deliverable described elsewhere)

Project Stage/LOD Deliverables		PHASE								
		PC - Project Confirmation SD - Schematic Design DD - Design Development CD - Construction Documentation C – Construction PO - Post Occupancy								
		PC	100% SD	90% DD	100% DD	33% CD	66% CD	99% CD	C	PO
Pre Design (PD) & Post Contract Award LOD 100										
	Pre-Execution Plan Meeting with Departmental Representative (D/R)	X								
	D/R Accepted BIM Execution Plan	X								
	Space Validation Schedule	X								
	Prelim Concept Massing Model									
	Site Survey Modeling/Site Adaptation Modeling									
Design (D) LOD 100, LOD 200 and LOD 300										
	Updated Concept Massing Models		X	X						
	Updated Space Validation									
	Presentation Renderings/Fly Through		X	X			X			
	Virtual Design Coordination		X	X				X		

Project Stage/LOD Deliverables	PHASE									
	C – Construction				PO - Post Occupancy				C	PO
	PC	100% SD	90% DD	100% DD	33% CD	66% CD	99% CD			
(Clash) Issues Log										
Energy Modeling										
For Construction Model					X		X			
<b>Construction (C) LOD 400 and LOD 500</b>										
Construction Model								X		
Trade Coordination Models								X		
Updated Model								X		
Shop Drawings - BIM Integrated										
Cx Data BIM Integrated								X		
Up-dated Cx Issues Logs								X		
Up-dated Clash issues Logs								X		
Up-dated Schedule								X		
Prelim Electronic O&M Data								X		
<b>Closeout (CO) LOD 500</b>										
Record/As-Built Model								X		
Hardcopy Record documents include drawing and specifications										
Electronic O&M Manual & Data										
Hard copy O&M Manual										
Electronic O&M Manual Training								X	X	

**2.3. DESIGN AND CONSTRUCTION DOCUMENT REVIEW**

- 2.3.1.** Prepare and submit design development and construction documents for review at 50%, and 99% of completeness for all disciplines. A review meeting shall be held to present and discuss each of the submissions. Preparation of Construction Documents shall not commence until after Design Development signoff.
- 2.3.2.** For review purposes provide PDF copy and eight (8) half size hardcopies and one (1) full size copy of all documents required for submission. Ten (10) business days prior to a scheduled review meeting, distribute copies as directed by the Departmental Representative. Review meetings are to be attended by the Contractor, the Designer,

Sub-consultants, and representatives of PWGSC and the Client. Contractor shall identify variance(s) from the Tender Documents for each signoff.

**2.3.3.** The Contractor shall submit a Request for Variance documentation to Departmental Representative any and all variances between the documents submitted for review and the requirements of the performance specification. Any additional cost associated with the variances must be identified and approved before proceeding. Justification shall be provided.

**2.3.4.** Coordinate and obtain approval from Departmental Representative for site access & lay down area.

## 2.4. CLOSE-OUT SUBMITTALS

### 2.4.1. Project Record Documents

#### (a) Facility Management Integration

- (1) Compile all As Built Documentations and Operations and Maintenance Manual information into an organized and user friendly electronic interface.
- (2) Product Information (PI) and Performance Verification (PV) form produced in Contract Documents and Commissioning shall be incorporated into the BIM Plan.
- (3) If the PI and PV information cannot be directly exported by means of MS Excel and MS Access, Contractor shall populate the Asset Validation System Module of Canada's Capital Asset Planning System, Facilities Capital Planning and Management System by VFA, Inc. and the Computerized Maintenance Management System (CMMS) using the software and training materials provided by Canada. Refer to Appendices for sample form.
- (4) Updating of Digital Drawings & Specification
  - (A) Contractor shall provide, as part of the contract requirements, the service of updating the digital drawings which were used to produce the contract drawings.
  - (B) BIM and/or AutoCAD drawing and specification shall be updated electronically to record same as-built information as specified in aforementioned clauses for the provision of paper and electronic as-built documentation. Deliver the digital information on CD, which shall contain:
    - (i) BIM and exported AutoCAD files
    - (ii) As Built drawings and specifications in PDF format.

### 3.0 ARCHITECTURAL PERFORMANCE SPECIFICATIONS

#### 3.1. GENERAL ARCHITECTURAL REQUIREMENTS

##### 3.1.1. Reference Codes and Standards

- (a) Work shall be in accordance with the requirements of the following codes, standards and to the requirements of authorities having jurisdiction. Where conflict occurs, the most stringent requirements shall apply.
  - (1) National Building Code of Canada
  - (2) National Energy Code of Canada for Buildings 2011.
  - (3) CAN/CSA-B651 – Barrier-Free Design.
  - (4) National Fire Code, Latest Edition.
  - (5) NFPA – National Fire Protection Association.
  - (6) Canada Labour Code – Part 2
  - (7) ASTM – American Society for Testing and Materials.
  - (8) AWMAC – Architectural Woodwork Manufacturers Association of Canada.
  - (9) CSDFMA – Canadian Steel Door and Frame Manufacturer's Association.
  - (10) CGSB – Canadian General Standards Board.
  - (11) CRCA – Canadian Roofing Contractors Association.
  - (12) CSA – Canadian Standards Association.
  - (13) NAAMM – National Association of Architectural Metal Manufacturers.
  - (14) NHLA – National Hardwood Lumber Association.
  - (15) ULC – Underwriters Laboratories of Canada.
  - (16) ANSI/ASHRAE/IES Standard 90.1-2010 -- Energy Standard for Buildings Except Low-Rise Residential Buildings
  - (17) Any other applicable codes, standards and regulations

##### 3.1.2. Reference Drawings and Documents

- (a) Work shall be in accordance with the requirements of this section and the architectural drawings. Work must also be coordinated with the requirements of the other disciplines.

##### 3.1.3. Facility Buildings and Structures

- (a) These specifications cover the following structures:
  - (1) Main Building
  - (2) PIL Booth
  - (3) Covered Inspection Lane
  - (4) Secondary Inspection Covered Canopy
  - (5) Generator Shed

##### 3.1.4. Conceptual Design

- (a) General
  - (1) Drawings and details provided in Conceptual Drawings are for reference only. Contractor shall be responsible for the project's final design and details.

- (2) Buildings maybe of combustible construction.
- (3) All Facility Buildings and Structures shall be designed and signoff by registered architect and engineers.
- (b) Site Requirements
  - (1) Coordinating entry points of site services including but not limited to plumbing and electrical services.
  - (2) Providing building anchoring details and coordinating with other Contractors structural loads for foundation design.
  - (3) Coordinating, confirming and verifying foundation design and dimensional details with other Contractors to ensure site dimensions and foundation design are adequate for the placement of the buildings.
  - (4) Coordinating on site and cooperating with other Contractors.
  - (5) Providing two exterior hose-bibs and exterior power outlets on opposite corners of the main building.
- (c) Massing, Exterior Treatment and Finishes
  - (1) The Main Building, Covered Inspection Lane and PIL Booth have level roofs. The Covered Inspection Lane has a higher building volume than the Main Building. If a Mechanical Penthouse is required, it shall have the same appearance as the other buildings.
  - (2) The exterior will be made of prefinished lap siding, fibreglass windows with coordinating colours complete with prefinished metal facia and flashing. The Covered Inspection Lane shall have a metal soffit with wood grain finish with recessed lighting recessed that coordinates with the width of the soffit.
- (d) Main Building & Covered Inspection Lane
  - (1) Finished floor of Main Building shall be flushed with exterior grade. Coordinate floor assembly thickness with the top of foundation wall.
  - (2) Any exposed building services in open ceilings shall be painted, grouped and organized visually.
  - (3) The roofing system is to be installed to allow for removal and reuse of the insulation at the time of future membrane replacement.
  - (4) All mechanical equipment shall be located within a mechanical room. Where roof mounted mechanical equipment maybe required, they shall be acoustically and visually enclosed and a mechanical penthouse shall be provided to house mechanical equipment on the roof. Provide sufficient space around equipment and passage ways for regular maintenance. All enclosures shall be compatible with the aesthetics of other architectural finishes. Passage ways for access to the mechanical room shall be light weight, have a different colour and be compatible with the roofing systems.
  - (5) Covered Inspection Lane shall have a minimum height clearance of 4.88 m (16'- 0") from roadway to underside of all objects such as signs and cameras.
  - (6) In the Main Building, the minimum floor to ceiling height shall be 2.74 m (9'- 0"), except for those areas having exposed roof structure.
    - (A) Where a mechanical penthouse is provided, a lockable access ladder in compliance with Federal and Provincial Occupational Health and Safety Regulations shall be provided inside the Covered Inspection Lane without obstructing any windows. The



equalization and drainage of the cavity behind the cladding. The design is to incorporate as many means as possible to shed water away from the wall surfaces.

- (b)** A building envelope consultant shall be hired to review the building envelope details prior to construction and submitting to Departmental Representative for review. Building systems shall take into consideration historical records of the past 100 years. Choose building systems that will last the life of the building over other inferior systems.
- (c)** The design approach must use the pressure equalized rainscreen wall design principles. The system includes the following:

  - (1)** Structural Wall/Wall Structure: Wall may be supporting the building structure or a structural infill wall between structural components. This is part of the air barrier system. If the Structural wall/Wall Structure is part of the Secure Perimeter, the design must comply the requirements for secure wall construction.
  - (2)** Continuous Air, Vapour Moisture Membrane installed on the exterior wall shall be supported by wall structure.
  - (3)** Install insulation tight to the exterior of the Air, Vapour Moisture Membrane.
  - (4)** A cladding system shall be designed based on rain screen principles, installed over an air space that is pressure equalized (vented) with the exterior and drained (weeped) to the exterior. The air space must provide a complete capillary break from the Insulation, Air Vapour Moisture Membrane and Wall Structure except for supporting components of the cladding. Minimum air space must be 25mm:

    - (A)** Vented spaces must be vented directly to the exterior. Venting into concealed spaces or other spaces such as projections is not permitted.
    - (B)** Weeped and Vented spaces must be protected by screens to prevent the ingress of insects and rodents.
- (d)** Provide large scale details to show how air barrier continuity will be achieved and how differential movements and construction sequences will be accommodated.
- (e)** Air, Vapour, Moisture Control:

  - (1)** Design envelope components to meet the characteristics of an Air, Vapour, Moisture control as required in the NBC or BCBC Part 5.
  - (2)** Locate the Air Barrier, Vapour Barrier, Secondary Moisture shedding plane as a single continuous membrane onto the structural wall. The primary moisture shedding plane is the cladding.
  - (3)** The air barrier consists of an assembly of materials acting together as a system. Minimize the number of materials used to form the air barrier. Foam in Place Insulation, Plastic film or spun-woven fibre film is not permitted as a primary air sealing element.
  - (4)** Minimize the number of changes of plane in the air barrier system.
  - (5)** Air barrier continuity and constructability must be given particular attention at:

    - (A)** Window and door frames, mechanical and electrical penetrations, structural and non-structural penetrations, wall/roof connections  
And changes in plane.
    - (B)** Joints between like and dissimilar materials.

- (6) Provide large scale details to show how air barrier continuity will be achieved and how differential movements and construction sequences will be accommodated.
- (f) Insulation:
  - (1) Design insulation to be secured manually and in direct contact with the exterior of the air barrier system.
  - (2) Insulation thickness should be based on energy modeling and life cycle cost analysis.
  - (3) Additional insulation is recommended to prevent ice damming.
  - (4) Minimize thermal bridging.
  - (5) The building thermal envelope (insulation) must be continuous.
- (g) Provide means to control temperature of interior surfaces where thermal bridging occurs.

**3.1.6.** Colour / Sample Boards

- (a) Submit to the Departmental Representative duplicate copy of a material, colour and pattern board to illustrate exterior and interior materials, quality, finish, colours and workmanship, for review and approval.

**3.1.7.** Mockup

- (a) Construct mockup panel of complete exterior wall construction. Mockup shall be minimum size of H 1.2m x W 2.4m.
- (b) Mockup will be inspected by Departmental Representative. Once accepted, mockup will become minimum standard for this work and may constitute part of the finished work.

**3.2. EXTERIOR SIDING & SOFFIT**

**3.2.1.** Materials

- (a) Siding shall be certified, tested and warranted for Canadian northern climate where the project is located.
- (b) Extruded Aluminum Siding
  - (1) Extruded Aluminum Siding with Alluminate bonded film finish in extruded aluminum with integrated venting system. Provide aluminum thermally broken backframing system as required.
  - (2) Manufacturer Qualifications: Minimum five years experience producing aluminum finishes of the types specified and AkzoNobel, AAMA 2605 and 2605 Certified.
  - (3) AAMA 2605 Superior Performance Standard
    - (A) Minimum Film Thickness 1.2 mils (30.5 micron).
    - (B) Crosshatch Adhesion Dry, Wet & Boiling 100 percent.
    - (C) Direct Impact Resistance 0.1 inch (2.54 mm) deformation minor crack / no pick off.
    - (D) HCl Resistance (10 percent): 15 minute spot no blister or color change.
    - (E) Mortar Resistance 24 hrs surface contact no adhesion or residue.
    - (F) Detergent Resistance 72 hrs immersion no change or loss of adhesion.

- (G) Humidity Resistance 4000 hrs 100 percent humidity #8 blister size maximum.
  - (H) Salt Spray Resistance Scribed 4000 hrs 5 percent solution minimum 7 on scribe, 8 on field.
  - (I) Metal Pretreatment: Non-chrome equivalent minimum of 4mg/sqft of E-CLPS.
  - (J) Pencil Hardness (minimum) F.
  - (K) Abrasion Resistance (l/mil) 40.
  - (L) Nitric Acid Vapor Resistance 30 minute exposure less than 5 DELTA\_SYMBOLE color change.
  - (M) Window Cleaner Resistance 24 hour spot test no visual change.
  - (N) Weathering 10 yrs Florida 5 DELTA\_SYMBOLE max. color change 50 percent gloss retention min. 8 chalk minimum (6 on whites) 10 percent film erosion maximum.
- (4) AAMA 2604 Performance Standard
- (A) Minimum Film Thickness 1.2 mils (30.5 micron).
  - (B) Crosshatch Adhesion Dry, Wet & Boiling 100 percent.
  - (C) Direct Impact Resistance 0.1 inch (2.54 mm) deformation minor crack / no pick off.
  - (D) HCl Resistance (10 Percent): 15 minute spot no blister or color change.
  - (E) Mortar Resistance 24 hrs surface contact no adhesion or residue.
  - (F) Detergent Resistance 72 hrs immersion no change or loss of adhesion.
  - (G) Humidity Resistance 3000 hrs 100 percent humidity #8 blister size maximum.
  - (H) Salt Spray Resistance Scribed 3000 hrs 5 percent solution minimum 7 on scribe, 8 on field.
  - (I) Metal Pretreatment: Non-chrome equivalent minimum of 4mg/sqft of E-CLPS.
  - (J) Pencil Hardness (minimum) F.
  - (K) Abrasion Resistance (l/mil) 20.
  - (L) Nitric Acid Vapor Resistance 30 minute exposure less than 5 DELTA\_SYMBOLE color change.
  - (M) Window Cleaner Resistance 24 hour spot test no visual change.
  - (N) Weathering 5 yrs Florida 5 DELTA\_SYMBOLE max. color change 30 percent gloss retention min. 8 chalk minimum 10 percent film erosion maximum.
- (5) Others
- (A) Aluminum extrusions: Aluminum Association alloy AA 6063-T5 and AA 6060.
  - (B) Sealants as recommended by manufacturer.
  - (C) Fasteners: exposed, stainless steel, purpose made, self tapping, as recommended by manufacturer.
  - (D) Adhesive: purpose made, waterproof, contact type, cured resilient without final set.

(c) Exterior Solid High Pressure Laminate Cladding Panel System

- (1) Material: Solid panel manufactured using a combination of high pressure and temperature to create a flat panel created from thermosetting resins, homogenously reinforced with wood-based fibers and an integrated decorative surface or printed décor.
- (2) Colour: As selected by the Architect from manufacturer's standard colour palette.
- (3) Finish: Satin sheen.
- (4) Physical Properties:
  - (A) Modulus of Elasticity: 9000 N/mm<sup>2</sup> minimum, ISO 178.
  - (B) Tensile Strength: 70 N/mm<sup>2</sup> minimum, ISO 527-2.
  - (C) Flexural Strength: 120 N/mm<sup>2</sup> minimum, ISO 178.
  - (D) Thermal Conductivity: 0.3 W/mK, EN 12524.
  - (E) Structural Performance:
    - (i) Panels, sub framing and attachment methods shall be designed to withstand the Design Wind Load as determined by the project façade engineer, or as determined by AS1170.2
    - (ii) Normal to the plane of the wall, the maximum panel deflection shall not exceed L/150
    - (iii) Normal to the plane of the wall between supports, deflection of the aluminum sub-framing members shall not exceed L/150.
- (5) Finish Performance: Electron Beam Cure resin in conformance with the following general requirements:
  - (A) Colour: As selected by the architect from manufacturer's standard colours or a custom colour to be matched by the panel supplier.
  - (B) Humidity Resistance: No formation of blisters when subjected to condensing water fog at 100% relative humidity and 38 degree Celsius for 3000 hours, ASTM D 2247.
  - (C) Salt Spray Resistance: Corrosion creepage from scribe line (1.6 mm max.) and minimum blister rating of 8 within the test specimen field, ASTM B117.
  - (D) Weather Exposure: Accelerated – 3000 hours in Atlas Type Weatherometer using cycle of 90 minutes light and 30 minutes diminished light and demineralized water with a maximum colour change of 5 Delta E units from the original colour according to ASTM D-2244, with the exception of Uni-Colours A04.0.1/A10.1.8/A20.2.3/A17.3.5/A12.3.7 which will not deviate more than 10 Delta E units from original colour according ASTM D-2244.
  - (E) Colour Stability: The decorative surface comply with classification 4 – 5 measured with the grey scale according to ISO 105 A02-93 (test method EN 438-2:29).
  - (F) Microbial Characteristics: Will not support micro-organic growth (ISO 846).
- (6) Mounting System:
  - (A) Concealed fastening on aluminium rail over metal sub framing.





- (b) Metal canopy shall be made of prefinished metal roof complete with prefinished metal flashing and soffits.
- (c) Each canopy is 1219mm x 1880mm.

### 3.4. ACOUSTICAL PERFORMANCE

#### 3.4.1. Reference Codes, Standards and Guidelines

- (a) National Building code
- (b) Professional Society Design Guidelines for Noise (American Society of Heating, Refrigerating, and Air-Conditioning Engineers – ASHRAE for mechanical system sound and vibration control)
- (c) American National Standards Institute – ANSI (Guideline for sound in building spaces and special spaces)
- (d) Manufacturer guidelines for noise control of mechanical equipment.

#### 3.4.2. Reference Drawings and Documents

- (a) Work shall be in accordance with the requirements of this section and must also be coordinated with the requirements of the other disciplines, particularly the architectural and mechanical general requirements and drawings.

#### 3.4.3. Noise Isolation Requirements

- (a) All wall assemblies shall have minimum STC rating of 45.
- (b) Wall assemblies for Detention Cells – Room 115 and Search Room – Room 116 shall achieve confidential speech privacy with minimum STC rating of 52 complete with applicable acoustical seals and door seals.

#### 3.4.4. Acoustical Finishes

- (a) Acoustical Ceiling Tiles, as defined in Architectural Performance Specifications – Suspended Acoustical Tile Ceilings should be installed in all occupied spaces unless it is prohibited for security reasons.
- (b) The area of the acoustical ceiling tile should be not less than the ceiling areas, excluding lights, diffusers and grilles. Acoustical materials must have an NRC of 0.65 or higher.

### 3.5. METAL FABRICATIONS

#### 3.5.1. Reference Standards:

- (a) Do welding work in accordance with CSA W59-1989.
- (b) Steel sections and plates: to CSA G40.20/G40.21-98, Grade 300W.
- (c) Steel pipe: to ASTM A53/A53M-01, standard weight, schedule 40, seamless black.
- (d) Welding materials: to CSA W59-1989.
- (e) Bolts and anchor bolts: to ASTM A307-00.
- (f) High strength bolts: to ASTM A325M-00.
- (g) Galvanizing: hot dipped galvanizing with zinc coating 600 g/m<sup>2</sup> to CAN/CSA G164-M92.
- (h) Shop Coat Primer: to CAN/CGSB-1.40-M97.

- (i) Zinc primer: zinc rich, ready mix to CAN/CGSB-1.181-92.
- (j) Isolation coating: alkali resistant bituminous paint or zinc chromate prime coat to CAN/CGSB-1.108.

- 3.5.2.** Design details and connections and fabricate structural steel in accordance with CAN/CSA-S10-01: Limit States Design of Steel Structures.
- 3.5.3.** Apply one shop coat of primer to metal items, with exception of galvanized or concrete encased items.
- 3.5.4.** Galvanize, after fabrication, exterior work.
- 3.5.5.** Touch-up field welds, bolts and burnt or scratched surfaces after completion of erection with primer.
- 3.5.6.** Touch-up galvanized surfaces with zinc rich primer where burned by field welding.
- 3.5.7.** Provide metal fabrications as required for all building components as well as the following:
  - (a) Stairs, handrails, guardrails and landings as required at all PIL Booths. Landings shall be steel bar gratings.
  - (b) Roof access ladders from ground level roofs.
  - (c) Above items to be painted.

### 3.6. ROUGH CARPENTRY

- 3.6.1.** Reference Standards:
  - (a) ASTM D 1761-[88(2000)], Standard Test Methods for Mechanical Fasteners in Wood.
  - (b) ASTM D 5055-[05], Standard Specification for Establishing and Monitoring Structural Capacities of Prefabricated Wood I-Joists.
  - (c) ASTM D 5456-[05a], Standard Specification for Evaluation of Structural Composite Lumber Products.
- 3.6.2.** Lumber
  - (a) Softwood Lumber, S4S, moisture content 19% or less in accordance with following standards:
    - (1) CAN/CSA-O141.
    - (2) NLGA Standard Grading Rules for Canadian Lumber.
  - (b) Glued end-jointed (finger-jointed) lumber is not acceptable.
  - (c) Wood I-joists in accordance with Prefabricated Wood I-Joists ASTM D 5055.
  - (d) Light-frame trusses in accordance with "Truss Design and Procedures for Light Metal Connected Wood Trusses", Truss Plate Institute of Canada.
  - (e) Structural Composite Lumber (SCL) in accordance with ASTM D 5456.
  - (f) Framing and board lumber: in accordance with NBC.
  - (g) Furring, blocking, nailing strips, grounds, rough bucks, cants, curbs, fascia backing and sleepers: S2S. Board sizes: "Standard" or better grade. Dimension sizes: "Standard" light framing or better grade. Post and timbers sizes: "Standard" or better grade.

- (h) Douglas fir plywood (DFP): to CSA O121, standard construction.
- (i) Canadian softwood plywood (CSP): to CSA O151, standard construction.
- (j) Fasteners
  - (1) Nails, spikes and staples: to CSA B111
  - (2) Bolts: 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.

**3.6.3.** Wood Preservative

- (a) Surface-applied wood preservative
  - (1) Clear copper naphthenate or 5% pentachlorophenol solution, water repellent preservative.
- (b) Provide pressure treated materials for the following applications:
  - (1) Wood cants, fascia backing, curbs, nailers, sleepers on roof deck.
  - (2) Wood furring on outside surface of exterior walls.

**3.6.4.** 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.

**3.6.5.** Provide backboards for mounting electrical equipment. Use 19 mm thick DFP. Install on 19 x 38 mm furring around perimeter and at maximum 300 mm intermediate spacing. Treat electrical equipment back boards with fire retardant paint.

**3.7. MILLWORK**

**3.7.1.** Reference Standards:

- (a) References, selection of materials, preparation, and quality of work standards shall be as listed in the Quality Standards for Architectural Woodwork published by the Architectural Woodwork Manufacturers Association of Canada (AWMAC).

**3.7.2.** Qualifications

- (a) Fabricators and installers shall have a minimum of 5 years proven satisfactory experience in the fabrication and installation of its systems specified in this section.

**3.7.3.** Softwood Lumber

- (a) Unless specified otherwise, S4S, moisture content 19% or less in accordance with the following standards:
  - (1) To CAN/CSA 0141-91.
  - (2) NLGA Standard Grading Rules for Canadian Lumber.
  - (3) AWMAC custom grade, moisture content as specified.

**3.7.4.** Canadian Softwood Plywood (CSP): to CSA 0151-M1978, standard construction.

- (a) Millwork must be fabricated with plywood backer board.

**3.7.5.** Solid Surface

- (a) Solid surface countertops shall be provided for all public counters in the facility. Products specified shall not require annual maintenance.

**3.7.6. Laminated Plastic**

- (a) To CAN3-A172
- (b) Laminated plastic for flatwork: to CAN3-A172, Grade GP, Type S, 1.15 mm thick, based on solid or printed pattern, colour range with matt finish.
- (c) Laminated plastic backing sheet: Grade BK, supplied by same manufacturer as facing sheet, not less than 0.5 mm thick or same thickness and colour as face laminate.
- (d) Casework shall be flush overlay type plastic laminates for all exposed parts, with semi-exposed parts finished to same material thickness and grade as exposed material, including both sides and edging of interior shelves and edge banding for drawers, doors and running trim.
- (e) Counter edges to be rounded stainless steel. Vanity counter top edges to be post-formed plastic laminate construction.

**3.7.7. Other Requirements**

- (a) Coordinate installation of plumbing and electrical items, concealed/contained in millwork.
- (b) Provide all necessary blocking, rough bucks, cants, sleepers, furring, equipment backboards, etc., as required to complete the project.
- (c) Depth and height of millwork in the business centre and front counters shall be reviewed and approved by Departmental Representative before finalizing the design. The front counters shall have file inserts as well as lockable pull-out drawers throughout its entire length. Locks shall be of same standard as the building keying system.

**3.7.8. Hardware**

- (a) Casework hardware shall include full extension metal guides for drawer, sized to meet expected load conditions; concealed European Style door hinges opening minimum 120 degrees and simple D type metal door and drawer pulls.

**3.7.9. Pegboard**

- (a) Provide pegboard panels of masonite 1220 mm by 1220 mm in the Storage Room. Mount board securely to back wall over workbenches.

**3.8. SHEET MEMBRANE AIR/VAPOUR BARRIER**

**3.8.1. Air Barrier**

- (a) Air Penetration: 0.001 cfm/ft<sup>2</sup> at 75 Pa, when tested in accordance with ASTM E2178. Type I per ASTM E1677.  $\leq 0.04$  cfm/ft<sup>2</sup> at 75 Pa, when tested in accordance with ASTM E2357.
- (b) Water Vapor Transmission: 28 perms, when tested in accordance with ASTM E96, Method B.
- (c) Water Penetration Resistance: Minimum 280 cm when tested in accordance with AATCC Test Method 127.
- (d) Basis Weight: Minimum 2.7 oz/yd<sup>2</sup>, when tested in accordance with TAPPI Test Method T-410.

- (e) Air Resistance: Air infiltration at >1500 seconds, when tested in accordance with TAPPI Test Method T-460.
- (f) Tensile Strength: Minimum 38/35 lbs/in., when tested in accordance with ASTM D882, Method A.
- (g) Tear Resistance: 12/10 lbs., when tested in accordance with ASTM D1117.
- (h) Surface Burning Characteristics: Class A, when tested in accordance with ASTM E84. Flame Spread: 10, Smoke Developed: 10.

**3.8.2.** Vapour Barrier

- (a) 6 mil polyethylene continuous, taped and sealed at all joints with minimum 150 mm overlap between sheets.

**3.9. THERMAL PROTECTION**

**3.9.1.** General

- (a) Information shown on Conceptual Drawings is for information only. Final design shall comply with requirements within the Specification.
- (b) All insulation shall be mineral wool, closed cell type or Spray Polyurethane Foam (SPF).
- (c) Effective RSI Value
  - (1) All insulation values listed are effective RSI values unless otherwise noted. Nominal RSI values shall be greater or equal to effective RSI value.
  - (2) Effective RSI values shall be determined in accordance with CAN/ULC-S770 and ASHRAE 90.1.
- (d) All exterior assemblies shall be thermally broken including but not limited to concrete slabs, roof assemblies and exterior walls.
- (e) At windows, air, vapour, moisture membrane should be mechanically fastened into window frame.
- (f) Main Building, PIL Booth and Mechanical Penthouse shall be insulated to standards set out in this section. Covered Inspection Lane is not a tempered space.

**3.9.2.** Roof Insulation

- (a) Extruded polyisocyanurate: to CAN/CGSB-51.26-M86 and CAN/ULC-S70 4.
- (b) Roof with attic space: effective RSI value to be minimum of 8.81 (R 50).
- (c) Roof without attic space: effective RSI value to be minimum of 4.90 (R 28).
- (d) Insulation to be installed in at least two layers with staggered joints.
- (e) Provide mineral fibre protection board between insulation and membrane to prevent adherence of insulation to membrane.

**3.9.3.** Wall Insulation

- (a) Provide insulation in thickness as required to obtain effective RSI 3.87 (R 22).
- (b) Mineral Wool Fibre Insulation: to CAN/ULC-S702 Type 1 and ASTM C 612 Type IVB.
- (c) Extruded polystyrene: to CAN/CGSB-51.20-M and CAN/ULC-S701, Type 3
- (d) Sprayed Urethane Foam Insulation (walls): to CGSB 51-GP-23M.

- (e) A portion of the wall insulation shall be installed in the exterior of the wall assembly to eliminate thermal bridging.
- (f) If thermal break is not provided between floor and foundation walls above a heated space, provide insulation of same RSI value to full height of foundation walls.

**3.9.4. Suspended Floor Insulation**

- (a) Extruded polystyrene, to CAN/CGSB-51.20-M87, Type 4; ship lapped edges.
- (b) Floor slabs shall be thermally broken where they intersect with exterior walls. Provide construction detail to minimize thermal bridging between suspended floor and foundation walls. Extend wall insulation below grade to create a thermal break as required.
- (c) Provide insulation on all suspended floors. Provide insulation in thickness as required to obtain effective RSI value of 4.90 (R 28).

**3.10. ROOFING SYSTEM**

**3.10.1. Quality Assurance**

- (a) Design complete roofing system, do roofing work and provide all materials to meet or exceed applicable Roofing Contractors Association of British Columbia (RCABC) standards and manufacturer's instructions / recommendations with 10 year guarantee.
- (b) Appoint and pay for independent inspection authority, acceptable to RCABC to provide onsite inspections and provide reports to the Departmental Representative. In addition to the regular roof inspection activities, the independent inspector must be on site carrying out the inspections when membrane is being installed.
- (c) Provide a minimum 10-year roofing system warranty by manufacturer with material and labor.
- (d) The roof covering shall have a minimum Class A classification, in accordance with the current National Building Code of Canada, Subsection 3.1.15.2.(1).

**3.10.2. Roofing Membrane and Water Collection**

- (a) Special coating for water proofing membrane on roof used for the containment of potable water. Special coating rapidly cures to form a seamless, abrasion resistant, and potable water approved waterproof liner. It shall be a two-component, high solids, elastomeric asphalt modified urethane designed for spray, squeegee, or roller application.
  - (1) Potable Water Certification: Submit certification that coating has been classified by ANSI certified laboratory to ANSI/NSF 61.
- (b) A 30 mil application of the membrane material shall be laid down, into which a polyester reinforcing scrim is placed, followed by another 30 mil application of the membrane material. Membrane shall be applied to line the inside of all gutters.
- (c) Membrane shall integrate with roof drains. The water collection system shall ensure that the water collected will be via a system approved for the transport of potable water.
- (d) Acceptable Product:
  - (1) C.I.M. Industries Inc. CIM 1061 with Saint-Gobain/Baymills Tietex 3.75 oz Polyester Scrim

**3.10.3. System Design**

- (a) Design complete system to allow for deflection of building structural system.
- (b) Design complete roofing system to allow for thermal contraction/expansion of roofing system components and other building components potentially affecting roofing system.
- (c) Substrate Board
  - (1) ASTM C 1177/C 1177M, glass-mat, water-resistant gypsum substrate with fire resistance rate.
- (d) Insulation Protection Board
  - (1) Semi-rigid asphaltic roofing substrate board composed of a mineral fortified asphaltic core formed between two asphaltic saturated fiberglass liners, 4.0 mm thick.
  - (2) Provide one or two layers as required by RCABC.

**3.10.4. Drainage**

- (a) Membrane to slope to drains at a minimum slope of 1:50. This is to be achieved through sloping of structural deck or through sloped insulation.
- (b) Provide positive slopes of 1:50 minimum (including valleys) to drains in the installation of roofing membrane and substrate or deck. Provide protection at drains to inhibit blockage due to accumulation of debris and to facilitate ease of maintenance.
- (c) Water collected from the roof shall be collected and connected to an underground cistern. Coordinate with Civil Drawings for cistern locations and plumbing requirements. Provide drain redundancies in case of drain clogging.

**3.10.5. Flashing and Sheet Metal**

- (a) Aluminum Sheet: Aluminum-zinc alloy coated steel sheet Class F1S to ASTM A792/A792M, commercial quality, grade 33 with AZ150 coating, regular spangle surface, 0.032" thick (0.8 mm) base metal thickness. Prefinished sheet with factory applied polyvinylidene fluoride to CGSB –GP-71.
- (b) Copper: ASTM B370, cold rolled 20-oz/sq ft; lacquered finish.
- (c) Galvanized Steel: ASTM A653, Grade A, G90 zinc coating; 24-gauge core steel.
- (d) Stainless Steel: ASTM A167, Type 304, 0.028" soft temper; smooth patterned finish.
- (e) Submit duplicate 50 x 50 mm samples of each type of sheet metal material, colour and finish.
- (f) Colour as selected by Departmental Representative from manufacturer's standard range.
- (g) Specular gloss: 30 units +/- 5 in accordance with ASTM D523.
- (h) Coating thickness: not less than 22 micrometres.
- (i) Resistance to accelerated weathering for caulk rating of 8, colour fade 5 units or less and erosion rate less than 20 % to ASTM D822 as follows:
  - (1) Outdoor exposure period 2500 hours.
  - (2) Humidity resistance exposure period 5000 hours.
- (j) Vent stack flashing: two-piece spun aluminum; insulated.

**3.11. ROOF ACCESS**

- 3.11.1.** Roof Access Hatch is not recommended to minimize risk of water ingress from excessive snow and water buildup. Where it is specified, it shall meet the following standards.
- 3.11.2.** Roof Access Hatch
- (a)** The roof access hatch shall be single leaf and pre-assembled from the manufacturer.
  - (b)** Performance Characteristics
    - (1)** Hatch cover shall be reinforced to support a minimum live load of 195 kg/m<sup>2</sup> (40 psf) with a maximum deflection of 1/150th of the span or 20 psf wind uplift.
    - (2)** Operation of the hatch shall be smooth and easy with controlled operation throughout the entire arc of opening and closing.
    - (3)** Operation of the hatch shall not be affected by temperature.
    - (4)** Entire hatch shall be weather tight with fully welded corner joints on cover and curb.
    - (5)** Entire hatch shall be insulated.
    - (6)** A minimum 200mm curb shall be provided.
  - (c)** Lifting mechanisms: Manufacturer shall provide compression spring operators enclosed in telescopic tubes to provide, smooth, easy, and controlled cover operation throughout the entire arc of opening and closing. The upper tube shall be the outer tube to prevent accumulation of moisture, grit, and debris inside the lower tube assembly. The lower tube shall interlock with a flanged support shoe through bolted to the curb assembly.
  - (d)** Hardware
    - (1)** Heavy pintle hinges shall be provided.
    - (2)** Cover shall be equipped with an enclosed two point spring latch with interior and exterior turn handles.
    - (3)** Roof hatch shall be equipped with interior padlock hasp.
    - (4)** Cover shall automatically lock in the open position with a rigid hold open arm equipped with a 25.4 mm diameter grip handle to permit easy release for closing.

### 3.12. SEALANTS

- 3.12.1.** References:
- (a)** ASTM C669-00 Standard Specification for Glazing Compound for Back Bedding and Face Glazing of Metal Sash.
  - (b)** CAN/CGSB-19.13-M87, Sealing Compound, One-component, Elastomeric, Chemical Curing.
  - (c)** CAN/CGSB-19-GP-14M-84, Sealing Compound, One Component, Butyl Polyisobutylene Polymer Base, Solvent Curing.
  - (d)** CAN/CGSB-19.17 M90, One Component, Acrylic Emulsion Base Sealing Compound
  - (e)** CAN/CGSB-19.21 M87 Sealing and Bedding Compound, Acoustical, non-hardening, non-skinning, permanently flexible.
  - (f)** Urethane, Two Part: to CAN/CGSB-19.24-M, Type 2, Class B.

**3.12.2. Sealant Material Designations:**

- (a) Urethanes One Part: Non-Sag to CAN/CGSB-19.13, Type 2.
- (b) Acrylics Latex One Part: To CAN/CGSB-19.17
- (c) Acoustical Sealant: To CAN/CGSB-19.21.
- (d) Security Sealant (Polyurethane): One component or two component polyurethane sealant, complying with ASTM C 920, Grade NS, Class 12.5 with a Shore A Hardness of 55 for all detention areas.
- (e) Preformed Compressible and Non-Compressible back-up materials.
  - (1) Polyethylene, Urethane, Neoprene or Vinyl Foam.
  - (2) Extruded open closed cell foam backer rod.
  - (3) Size: oversize 30 to 50%.
  - (4) Neoprene or Butyl Rubber.
    - (A) Round solid rod, Shore A hardness 70.
  - (5) High Density Foam: Extruded closed cell polyvinyl chloride (PVC), extruded polyethylene, closed cell, Shore A hardness 20, tensile strength 140 to 200 kPa, extruded polyolefin foam, 32 kg/m<sup>3</sup> density, or neoprene foam backer, size as recommended by manufacturer.
  - (6) Bond Breaker Tape: Polyethylene bond breaker tape which will not bond to sealant.

**3.12.3. Sealant Selection:**

- (a) Design sealant joints for thermal movement of component materials caused by ambient temperature range of +40 to -40 C without causing buckling, failure of joint seals, or other detrimental effects.
- (b) Select sealant to suit particular conditions of the job, with careful adherence to the manufacturer's instructions for application.
- (c) Colour of Sealant: provide sealant colour to match adjacent surfaces and resistant to ultra-violet degradation or fading..
- (d) Perimeters of exterior openings where frames meet exterior façade of building, Sealant Type: CAN/CGSB- 19.13-M87.
- (e) Expansion and control joints in exterior surfaces of poured-in-place concrete walls: Sealant Type CAN/CGSB-19.13-M87.
- (f) Control and expansion joints in exterior surfaces of unit masonry walls: Sealant Type CAN/CGSB-19.13-M87.
- (g) Interior perimeters of exterior openings: Sealant type: CAN/CGSB – 19.13-M87.
- (h) Control and expansion joints on the interior of exterior surfaces of unit masonry walls: Sealant Type CAN/CGSB-19.13-M87.
- (i) Interior control and expansion joints in floor surfaces: Sealant type CAN/CGSB-19.13-M87.
- (j) Perimeters of interior frames: Sealant type: CAN/CGSB-19.13-M87.
- (k) Interior masonry vertical control joints (block to block, block to concrete, and intersecting masonry walls): Sealant Type CAN/CGSB-19.13-M87.
- (l) Perimeter of bath fixtures (e.g. sinks, tubs, urinals, stools, water closets, basins, vanities, counters, plastic laminate and adjacent wall finish, etc.): Sealant type: CAN/CGSB-19.17 M90
- (m) Exposed interior control joints in drywall: Sealant type: CAN CGSB-19.13-M87.
- (n) Acoustical Sealant CAN/CGSB-19.21-M87.

**3.12.4.** Accessories: primers, joint cleaners and backing as required.

### **3.13. DOORS AND FRAMES**

**3.13.1.** This section includes: exterior and interior steel doors, interior wood doors, steel frames, sectional metal insulated overhead doors and detention door assembly.

**3.13.2.** For aluminum man doors, see section 11.14 Aluminum Doors, Windows and Frames.

**3.13.3.** For Door Hardware, see Schedule of Hardware.

**3.13.4.** References

- (a) NFPA 80-1999 Fire Doors and Windows.
- (b) NFPA 252-1995: Fire Tests of Door Assemblies.
- (c) ASTM A 366/A 366M-91(1993) Specification for Steel, Carbon, Cold-Rolled Sheet, Commercial Quality.
- (d) ASTM A 653/A 653M-95 Specification for Steel Sheet, Zinc-Coated (Galvanized) by the Hot-Dip Process, Commercial Quality.
- (e) CAN4/ULC-S104-M80 (R1985), NFPA 252-1990: Fire Tests of Door Assemblies.
- (f) CAN/ULC-S105-M85 (R1992) Fire Door Frames.
- (g) CAN/CSA-G40.20-M92 General Requirements for Rolled or Welded Structural Quality Steel.
- (h) CAN/CGSB-1.40-M89 Primer, Structural Steel, Oil Alkyd Type.
- (i) CAN/CGSB-1.181-92 Coating, Zinc-Rich, Organic, Ready Mixed.
- (j) CAN/CGSB 51-GP-21M Thermal Insulation, Urethane and Isocyanurate, Unfaced.
- (k) CAN/CGSB-12.1-M90 Tempered or Laminated Safety Glass.
- (l) Canadian Steel Door Manufacturers Association (CSDMA): Dimensional Standards for Commercial Steel Doors and Frames.
- (m) National Association of Architectural Metal Manufacturers (NAAMM); Hollow Metal Manufacturers' Association (HMMA): NAAMM/HMMA 840 Installation Guide for Commercial Steel Doors and Frames
- (n) HMMA 863 – Guide Specifications for Detention Security Hollow Metal Doors and Frames
- (o) ASTM F 2322 – Standard Test Methods for Physical Assault on Vertical Fixed Barriers for Detention and Correctional Facilities
- (p) ASTM F 1450 – Standard Test Methods for Hollow Metal Swinging Door Assemblies for Detention and Correctional Facilities (Passes Security Level 1)
- (q) ASTM F 1592 – Standard Test Methods for Detention Hollow Metal Vision Systems (Passes Security Level 1) – Single Light and Multi Light Assembly Impact Test

**3.13.5.** Steel Doors and Frames:

- (a) Exterior doors shall be polyurethane insulated steel construction, 1.2 mm thick sheet steel, commercial grade, flush, 4.45 cm thick. Insulating materials may not contain CFC based blowing agents.
- (b) Exterior frames to be thermally broken, constructed of 1.6 mm thick welded pressed steel.

- (c) All exterior doors shall have weather protection at least 3'-0" from the face of the building. Drainage shall be provided to prevent water buildup and to prevent and provide access for debris removal. Canopies shall be either laminated glass or composite aluminum clad canopies.
- (d) Interior doors frames to be 1.6 mm thick welded pressed steel frame.
- (e) Door and frame materials and construction by a manufacturer currently listed as a member of CSDFMA.
- (f) All portions of steel doors and steel frames to be painted.

**3.13.6. Overhead Door**

- (a) Basis of Design
  - (1) Door Size: min. 3.96m W x 4.88m H (13'-0" W x 16'-0" H)
  - (2) Glazed overhead coiling door formed with curtain of interlocking aluminum framed clear glazed window slats (over 70 percent transparency).
  - (3) Overhead counterbalance system, motor and gearbox drive system.
  - (4) Door side frames.
  - (5) Control panel, activation devices, and safety sensor devices.
- (b) Provide two high-speed roll doors and all components and accessories by one manufacturer. It shall be a non-swinging door used primarily to facilitate vehicular access or material transportation.
  - (1) Opening Speed: Door to operate at a variable speed up to 80 inches (2032 mm) per second.
  - (2) Closing Speed: Door to operate at a variable speed up to 24 inches (609.6 mm) per second.
  - (3) Operation Cycles: Drive motor and gearbox capable of operating for not less than 1,000,000 cycles. One operation cycle is complete when a door is opened from the closed position to the fully open position and returned to the closed position.
  - (4) Wind Resistance: Up to 21 lbf/sq. ft. (90 mph) (145km/hr).
- (c) Installer Qualifications: Installers, trained by the primary product manufacturer, with a minimum 3 years documented experience installing and maintenance of units similar in material, design, and extent to that indicated for this Project and whose work has resulted in construction with a record of successful in-service performance.
- (d) Special Product Warranty: Manufacturer's warranty in which manufacturer agrees to repair or replace components which fail to perform as follows:
  - (1) 5-year / 1,000,000 Cycle Limited Warranty on Drive Motor and Gearbox.
  - (2) 2-year / 300,000 Cycle Limited Warranty on all other Mechanical and Electrical Components.
- (e) Door Curtain Design: Glazed Door Curtain Slats: Low profile, double aluminum framed glazed slats with over 70 percent glazing.
  - (1) Slats shall be designed with an overlap, which prohibits knife or pry-bar entry and prevents water from collecting on rubber weather seal (exterior side). Hingeless slat connection allows the door to function with missing slats. Each individual slat can be removed and replaced. Continuous gaskets between slats to be highly durable EPDM rubber weather seal.

Slats individually attached to braided steel reinforced lifting belt. Wireless failsafe electric safety edge bottom bar.

- (f) Curtain Jamb Guides: 11 gauge steel sections, which includes the lateral structural frame assembly with a bolt on cover, to guide the door panel in its upward and downward movement. Tracks lined with HDPE for smooth panel movement. Galvanized steel guides and frame shall be powder coated finish.
- (g) Top Roll System: 4.25 inches (108 mm) diameter, steel tube - 11 gauge steel complying with ASTM A513. Drum tube deflection shall not exceed 0.01 inch (0.254 mm) per foot and shall not exceed 0.14 inches (0.3556 mm) over the entire length. Disc drive system for frictionless winding of door curtain. Door slats shall not contact one another when door is rolled up on drum tube.
- (h) Counterbalance system: Internally mounted counterbalance system shall utilize extension springs along with a belt and pulley mechanism. Torsion spring shall not be located within the top roll barrel. Redundant springs keep the door operating should a primary spring break. Durable machined aluminum pulleys. Each pulley shall contain two permanently sealed and lubricated ball bearings. Provide manufacturer's standard factory 1.18 inch (29.97 mm) nylon belting.
- (i) Electric Door Operator: Reversible-type motor with controller for motor exposure indicated with heavy duty usage classification, rated up to 25 cycles per hour and over 500 cycles per day for exterior and interior use. Operator is mounted to the header assembly on the left or right side of door and connected to door drive shaft. Electrical Characteristics shall be one phase, 220 Volt., 50/60 hertz with minimum 1.5 horsepower in-line hollow shaft two-stage bevel drive.
- (j) Emergency Manual Operation: Disengagement lever which puts the door in a spring balanced state and allows door to be manually opened by hand in the event of a power failure.
- (k) Limit Switch: Equip each motorized door with a proximity switch detecting the bottom slat of the moving door panel interlocked with motor controls and set to set the control's reference position and automatically stop door at fully opened position.
- (l) Encoder: Equip each motorized door with a rotary encoder mounted on the drive motor for precise positioning and speed regulation of the door in operation.
- (m) Timer: Each door to have automatic closing controlled by an adjustable hold open time delay.
- (n) Control Panel: MCC controller housed in a NEMA 4 rated enclosure. Controls must include a Vector Control drive system capable of infinitely variable speed control in both the up and down directions and integrated programmable capability allowing field customization of logic I/O functionality without adding components. Operational parameters must be set from the Graphical User Interface (GUI). Controller comes with factory set parameters and a 64 bit scrollable graphic/text display. Display shows functional information during normal operation and will advise if maintenance is required. Controls must be fully self-diagnostic thru the GUI and provide corrective actions for error conditions. Control interface must display options and guidance in full text displayed language. Language options must be available in English or French, languages. Door must be provided with electronic encoder. A proximity or rotary switch must be provided to accommodate the top position reference.
- (o) Pedestrian Type Activation Devices:
  - (1) Three Push Button Switch: Button for open, button for close, button for stop. Provide two switches at the PIL Booth (one at each post) and one beside each overhead door.

- (2) Motion Sensor: BEA Falcon, microwave scanner, field adjustable wide angle on both sides of the door.
  - (A) Differentiates between pedestrian and vehicular traffic.
  - (B) Prevents false activation from cross traffic,
  - (C) Remote control for set-up.
- (3) Presence Sensor: BEA IRIS, active infrared on both sides of the door.
  - (A) Detects slow moving or non-moving persons or objects.
  - (B) Prevents premature automatic closing of door when pedestrians working near doorway.
  - (C) Remote control for set-up.
- (p) Vehicular Type Activation Devices:
  - (1) Motion Sensor: BEA Falcon, microwave scanner, field adjustable wide angle.]
    - (A) Differentiates between pedestrian and vehicular traffic.
    - (B) Prevents false activation from cross traffic,
    - (C) Remote control for set-up.
  - (2) Radio Control Activation: Four (4) near proximity portable push button remote control programmable to individual doors or multiple doors in common.
    - (A) Four Button Remote Control x 4
- (q) Spare Parts
  - (1) Provide one set of spare parts on all components that require regular replacement.
  - (2) Provide two extra remote and system batteries.
- (r) Safety Devices
  - (1) Door to be provided with a safety light curtain system. Light curtain must be housed inside of the side jamb guide assembly and cover an area to a height of no less than six feet. Light curtain system must have a minimum of 40 infrared thru-beam optical sensors. Control panel interface must indicate safety device errors in full text displayed language in the event of an abnormal condition. Door to be provided with failsafe electric safety edge. Door controller must indicate if the safety edge is not operable. Connections between the safety edge and controller must be fully wireless. No coil cords allowed.
  - (2) Door must be provided with a spring-balanced egress system allowing the door panel to open manually without the use of hand cranks in the event of a power outage. Counter-balance design must allow the door to be opened in event of power failure.
- (s) Finish Requirements
  - (1) Comply with NAAMM/NOMMA's "Metal Finishes Manual for Architectural and Metal Products (AMP 500-06)" for recommendations for applying and designating finishes.
  - (2) Appearance of Finished Work: Noticeable variations in same piece are not acceptable. Variations in appearance of adjoining components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.
- (t) Aluminum Finishes: Anodized Finish AAMA 611, Custom anodized to match architectural siding.

- (u) Steel Finishes: Galvanized Steel, nominal 0.028-inch (0.71-mm) thick, hot-dip galvanized steel sheet with G90 (Z275) zinc coating, complying with ASTM A 653/A 653M.
- (v) Acceptable Product:
  - (1) Albany Door Systems RR3000 Vision High Speed Metal Doors

**3.13.7. Window Frames**

- (a) Exterior frames shall be fibreglass frames.
- (b) Design to NAFS Standard and A440S1-09 Canadian Supplement to AAMA/WDMA/CSA 101/I.S.2/A440, NAFS – North American Fenestration Standard/Specification for Windows, Doors, and Skylights.
- (c) Classification Rating: to CAN/CSA-A440
  - (1) Air leakage: A3
  - (2) Water leakage: B7
  - (3) Wind load resistance: C5
  - (4) Condensation resistance: I69
- (d) Sealants
  - (1) Refer to Sealant Section.
- (e) Fixed interior steel windows and glazing shall be in standard frames.
  - (1) Frame: 16 gauge (1.5 mm) thick steel.
  - (2) Provide complete interior window enclosures including frames and sealed glazing units.
  - (3) All windows to be supplied by same manufacturer.

**3.14. SECURED AREAS – DETENTION BLOCK & OTHERS**

**3.14.1. General**

- (a) Secured Areas shall include the following:
  - (1) LAN Room – Room 110
  - (2) Storage Room – Room 112
  - (3) Room BSF241 – Room 113
  - (4) Traveller Processing S – Room 114 & 114a
  - (5) Traveller Processing C – Room 115
- (b) Provide detention room door, door hardware, walls, floors and ceilings to Secured Areas. Detention locks are not required in Room 110, 112 & 113.
- (c) Detention area perimeter walls shall be two hour rated complete with detention grade smoke detectors in all detention areas as per mechanical. Corresponding doors shall be rated for 90 minutes. Fire rating within the detention perimeter is not required.
  - (1) Where glazing is specified and fire rating is required, glazing shall be rated for 90 minutes, clear and wireless with rated framing. Apply security film to both sides complete with Impact Protection Film Attachment Systems.

**3.14.2. Detention Room Floor, Wall & Ceiling Construction**

- (a) Detention rooms along with associated processing space shall be secure without any openings in the walls except when required for services accessed from the

outside of the secured area. The detention rooms in the facility shall have secured ceilings. Locations will be shown in the Conceptual Drawings.

- (b) All detention cells shall have on the attack side 16mm impact resistant drywall acoustically sealed top and bottom, 16mm plywood, Metal Barrier fixed at every 305mm on centre, 140mm wood stud at 305mm on centre complete with 75mm batt insulation. Secured ceilings and floors shall be of similar construction.
- (c) Metal Barrier
  - (1) Flattened Metal Mesh: To EMMA 557-99. Style ¾-9F: nominal strand thickness of 0.120" (0.108" to 0.132"). Diamond opening of 0.563" x 1.688". OR
  - (2) Sheet Steel: 16 Ga, A1008 / A1008M (cold rolled) or A1011/ A1011M (hot rolled) or equivalent.
- (d) Pre-engineered detention systems may be used in place of standard construction.
  - (1) Acceptable Products: Trussbilt Steel Security Wall System

### 3.14.3. Detention Room Windows, Doors & Frames

- (a) Detention Doors and Frames
  - (1) Products covered by this specification shall be tested by an independent, nationally recognized agency in accordance with ASTM F1450 and ASTM F1592 test methodology with strict conformance to ANSI/NAAMM 863, Section 1.05. Products shall meet each of the following NAAMM 863 performance criteria:
    - (2) Static Load Test - Under 14,000 lb (62,272N) load, maximum mid-span deflection shall not exceed 0.58" (14.7mm) and after release of load, deformation shall not exceed 0.10" (2.5mm).
    - (3) Rack Test - Under 7,500 lb (33,360N) corner load, maximum deflection shall not exceed 3.5" (88.9mm) and there shall be no buckling or failure of welds.
    - (4) Impact Load Test - After 600 impacts of 200 ft-lbs (271.2J) each on the door face, within 6" (150mm) of the lock bolt and 150 impacts within 6" (150mm) of each hinge, the door shall remain closed and locked, the assembly shall not be damaged to the extent that forcible egress can be obtained, the door shall be capable of being unlocked with the key and the door shall be operated to provide egress.
    - (5) Removable Glazing Stop Test - After 600 impacts of 200 ft-lbs (271.2J) each, the removable glass stops and steel plate shall remain firmly in place so that removal of the plate cannot be accomplished without removing the glazing screws and there shall be no more than one (1) broken glazing screw in the assembly.
    - (6) Fire labelled product shall be provided for those openings requiring fire protection ratings, as scheduled. Products shall be tested in strict conformance with CAN4-S104, listed by Underwriters Laboratories of Canada or Warnock Hersey under an active Factory Inspection Program and shall be constructed as detailed in Follow-Up Service Procedures issued to the manufacturer.
    - (7) Where security glazing materials are specified, removable 2.7 mm formed steel "Z" angle stops shall be provided. Corners shall be fully welded forming a one (1) piece frame. Frame shall be secured with ¼ - 20 button head, tamper resistant torx plus machine screws at 150 mm on center

maximum, two (2) per stop minimum. Minimum stop height shall be 25 mm.

- (b) Detention Security Windows
  - (1) Provide 20" x 26" glazed opening to all detention doors in Room 114 and 114a. Provide one detention grade 12" x 18" glazed sliding shutter to cell door in Room 115.
  - (2) Glazing shall exceed ASTM F 1592, ASTM E283, ASTM E330, ASTM E331, ASTM E547 Criteria
  - (3) Detention glazing and glazing at detention doors shall exceed ASTM F1233 Class IV, ASTM 1915 Grade 1, HP White Level III-TP-0500.02
- (c) Detention Door Hardware
  - (1) Provide Latch and Key Operated Deadlocks to all spaces in detention area.
  - (2) Exceed ANSI/BHMA A156.13 Series 1000 Security Grade 1.
  - (3) Detention Hinges to exceed ASTM F1758 Grade 1.
  - (4) Acceptable Products: Folger Adams 60K Series Detention Lock in cells. Add Double SK option in detention corridors.

#### 3.14.4. Detention Room Miscellaneous Specialties

- (a) Stainless Steel Bench (Item X)
  - (1) Minimum 30" deep 10 ga. stainless steel pan with continuous seam welds between sheet metal joints.
  - (2) Provide 1" seam welds every 2" between at tubing/sheet metal or tubing/tubing
  - (3) Bench shall be 18" AFF anchored to the reinforced wall/floor.
- (b) Stainless Steel Table 1 (Item V)
  - (1) 36" x 36" Stainless Steel Table 42" AFF with Min. 3" Radius Corners.
  - (2) 25" is chamfered off on two sides.
  - (3) Minimum 12 ga. stainless steel pan with continuous seam welds between sheet metal joints.
  - (4) Securely Anchored to Ground.
- (c) Stainless Steel Table 2 (Item W)
  - (1) 36" x 36" Stainless St. Table 30" AFF with Min. 3" Radius Corners
  - (2) Minimum 12 ga. stainless steel pan with continuous seam welds between sheet metal joints.
  - (3) Provide attached swivel out seating at 18" AFF.
  - (4) Securely Anchored to Ground.
- (d) Security Sealant
  - (1) Seal all gaps in detention area with "pick proof" sealant to ASTM C881, Types I, II, III, IV, V; Grade 3; Class A, B and C.
  - (2) No gaps can be exposed where contrabands can be concealed.
  - (3) Acceptable Products: Sika AnchorFix-4<sup>CA</sup>.
- (e) Locking Adhesive
  - (1) All fasteners shall be installed with locking adhesive.

### 3.15. GLAZING

**3.15.1.** Glazing to the following standards:

- (a) ANSI/ASTM E330-02, Test Method for Structural Performance of Exterior Windows, Curtain Walls and Doors by Uniform Static Air Pressure Difference.
- (b) CAN/CGSB-12.1-M90 Tempered or Laminated Safety Glass
- (c) CAN/CGSB-12.4-M91, Heat Absorbing Glass
- (d) CAN/CGSB-12.5-M86 Mirrors, Silvered
- (e) CAN/CGSB-12.8-97 Insulating Glass Units
- (f) Flat Glass Manufacturers Association (FGMA) Glazing Manual
- (g) Laminators Safety Glass Association (LSGA) Standards Manual.

**3.15.2.** Exterior glazing

- (a) All exterior glazing shall be thermally broken fibreglass. It shall have minimum ER Rating of 34, U-factor 1.20 W/m<sup>2</sup>•K, insulated frame, low E, warm edged spacer, argon or krypton fill, hermetically seal units. Both lights shall be tempered, minimum 6mm thick. Specificity of the glazing shall be dependent on the orientation of the building.
- (b) Exterior glazing shall be tinted in all areas. Uncoated tinted glass with shading coefficient 0.70 and average daylight transmittance 75 percent.

**3.15.3.** Interior glazing

- (a) All interior glazing to be clear tempered, minimum 6 mm thick single glazed units.
- (b) Glazing in rated partitions/doors: Use of wired glass is unacceptable.

**3.15.4.** Sliding Window

- (a) The window is constructed from proprietary designed robust anodized aluminum extrusions, high quality moving parts and tempered glass. All frames are fastened with screws, the joints are sealed and the glass is wet glazed (exterior) and dry glazed (interior) creating a quality weatherproof product that will last for many years.
- (b) 5 year warranty backed by a service network in North America
- (c) ETL listed product
- (d) Weatherproofing: double weatherstripping, interlocking jambs and sloped sills
- (e) Minimum of 2 security locking features
- (f) Top hung moving panel construction
- (g) 1" insulated tempered glass unit
- (h) Anodized aluminum powder coated to match adjacent window frames
- (i) 120 volt electrical window supply with low voltage drive system and controls
- (j) Fully assembled and ready to install
- (k) Acceptable Product: Easi-Serv In-line Side Slider SS-2 Manual with low noise Air Curtain

**3.15.5.** Security Film

- (a) Physical / Mechanical Performance Properties (nominal):
  - (1) Film Color: Clear
  - (2) Film Thickness (excluding coatings or adhesive liner): Nominal 8 mils
  - (3) Balance of Film Properties (ASTM D882)

- (A) Tensile Strength Ratio (MD / TD): not to exceed +/- 10%
- (B) Elongation at Break Ratio (MD / TD): not to exceed +/- 15%
- (4) Tensile Strength (ASTM D882):
  - (A) Base Film: 32,000 psi (MD) / 32,000 psi (TD)
  - (B) Coated Film: 27,000 psi (MD) / 27,000 psi (TD)
- (5) Break Strength (ASTM D882):
  - (A) Base Film: 250 lb/in (MD) / 250 lb/in (TD)
  - (B) Coated Film: 215 lb/in (MD) / 215 lb/in (TD)
- (6) Percent Elongation at Break (ASTM D882):
  - (A) Base Film: 115 % (MD) / 115 % (TD)
  - (B) Coated Film: 90 % (MD) / 105 % (TD)
- (7) Yield Strength:
  - (A) Base Film: 12,000 psi (MD)
  - (B) Coated Film: 15,000 psi (MD)
- (8) Percent Elongation at Yield (ASTM D882):
  - (A) Base Film: 7% (MD)
  - (B) Coated Film: 8% (MD)
- (9) Young's Modulus (ASTM D882):
  - (A) Base Film: 550 kpsi (MD) / 600 kpsi (TD)
  - (B) Coated Film: 550 kpsi (MD) / 600 kpsi (TD)
- (10) Graves Tear Resistance (ASTM D1004):
  - (A) Maximum Force (lbs):
    - (i) Base Film: 40 (MD) / 40 (TD)
    - (ii) Coated Film: 40 (MD) / 40 (TD)
  - (B) Maximum Extension (in):
    - (i) Base Film: 0.45 (MD) / 0.65 (TD)
    - (ii) Coated Film: 0.50 (MD) / 0.57 (TD)
  - (C) Graves Area Tear Resistance (lbs%):
    - (i) Base Film: 1,100 (MD) / 1,300 (TD)
    - (ii) Coated Film: 1,100 (MD) / 1,300 (TD)
- (11) Puncture Propagation Tear Resistance (ASTM D2582):
  - (A) Coated Film: 9 lbf (MD) / 10 lbf (TD)
- (12) Puncture Strength (ASTM D4830)
  - (A) Coated Film: 185 lbf
- (b) Acceptable Product:
  - (1) 3M Ultra S800 with Impact Protection Film Attachment Systems on the interior complete with 3M AG7 on the exterior
  - (2) 3M Ultra S800 with Impact Protection Film Attachment Systems on both sides of the interior

### 3.15.6. Daylight Redirecting Film

- (a) Provide window film designed to move excess light close to the window and redirect it deeper into the building to increase the daylighting penetration.
- (b) Acceptable Product: 3M Daylight Redirecting Film

### 3.16. HARDWARE

#### 3.16.1. This section includes:

- (a) Design and preparation of finish door hardware specifications and hardware schedule.
- (b) Supply and installation of finish door hardware.
- (c) Quality control site inspection services.

#### 3.16.2. Reference Standards

- (a) ANSI/BHMA: American National Standards Institute and Builders Hardware Manufacturers Association – Standards for the manufacturing and testing of finish door hardware.
- (b) DHI: Door and Hardware Institute of Canada
- (c) NBC-2005, National Building Code of Canada
- (d) ANSI/BHMA A156.1-2000, Butts and Hinges
- (e) ANSI/BHMA A156.3-2001, Exit Devices
- (f) ANSI/BHMA A156.4-2000, Door Controls (Closers)
- (g) ANSI/BHMA A156.5-2001, Auxiliary Locks and Associated Products
- (h) ANSI/BHMA A156.13-2005, Mortise Locks and Latches
- (i) ANSI/BHMA A156.18-2000, Materials and Finishes
- (j) ANSI/BHMA A156.19-2002, Power Assist and Low Voltage Energy Power Operated Doors
- (k) CSA B651-04, Accessible Design for the Built Environment

#### 3.16.3. Design Requirements

- (a) Obtain to services of a qualified Architectural Hardware Consultant (AHI), certified by the Door and Hardware Institute to:
  - (1) Develop door hardware design requirements by meeting with the project Design Team and with the Departmental Representative.
  - (2) Prepare door finish hardware specification based on requirements of the NBC, other applicable codes, Federal Human Resources Fire Commissioner of Canada, CSA B651, DHI best practices and door hardware minimum requirements stipulated below.
  - (3) Prepare Door Hardware Schedule indicating all hardware required for each door.
  - (4) Coordinate and select door hardware items and function with door access control system, building security system and building emergency and fire safety systems specified in other sections of this project.
  - (5) Submit Hardware Schedule for review and approval. Attend meetings with Departmental Representative and respond to queries to ascertain user requirements will be met.

#### 3.16.4. Requirements Regulatory Agencies

- (a) Hardware for doors in fire separations and exit doors certified by a Canadian Certification Organization accredited by Standards Council of Canada.

#### 3.16.5. Quality Assurance

- (a) Standard of Acceptance: named manufacturer and model number when listed in this section are included for the sole purpose of describing hardware function and to further define the level of quality required for a specific hardware item. Products from other manufacturer are not excluded. Include technical data on proposed hardware to be supplied as part of the Contract Hardware List to be submitted during the shop drawing submittal process.
- (b) See the quality control section for site inspection services required during the construction stage.

**3.16.6.** Shop Drawing Submittal

- (a) Prior to ordering the hardware, submit Contract Hardware List from supplier for review by Departmental Representative.
- (b) Hardware list to include manufacturer's name make, model number, material, function, size, finish and other pertinent information for all hardware items of each door.
- (c) Include with Hardware list a photocopy of manufacturer's technical product data, for each hardware item being supplied.

**3.16.7.** Maintenance Data

- (a) Provide operation and maintenance data for all door hardware. Include in O&M Manual.
- (b) Supply two sets of wrenches for door closers, locksets and exit devices.

**3.16.8.** Hardware

- (a) Provide door hardware complying to ANSI/BHMA Standards, of heavy duty institutional grade 1 rating supplemented by additional requirements specified herein.
- (b) When specified standard does not exist, the hardware item shall be specifically made to suit the specific function, be heavy duty designed for institutional applications and have been proven in use.
- (c) Use products from one manufacturer for all similar items.
- (d) Equip each door with all required door hardware as recommended by DHI best practises and ANSI/BHMA standards to:
- (e) Allow proper functioning and operation of door to suit building use;
- (f) Comply with applicable codes having jurisdiction and barrier free requirements of CSA B651;
- (g) Meet building user's operational and security requirements;
- (h) Door Hardware Minimum Requirements
  - (1) Locksets and latchsets: mortised type for all doors to ANSI A156.13, series 1000, heavy duty grade 1, designed for function as stated in Hardware Schedule and having 19 mm latch bolt throw and 25 mm deadbolt throw and as follows:
    - (A) Acceptable Products: Sargent "J" lever, Schlage "03" or Corbin "Lustra"
  - (2) Trim Design: lever design, solid handle contoured C shape angle return.
    - (A) Provide rectangular escutcheons with concealed tamperproof fasteners on secure doors as identified by Departmental Representative. Round roses are suitable for most doors.

- (B)** Acceptable Products: Sargent 8200 series, Schlage L9000 series, Corbin-Russin ML2000 series
- (i)** Detention Locks: as specified in the Door and Frame section.
- (j)** Electromagnetic Locks: not permitted.
- (k)** Cylinders (for locksets, exit devices and other locks): 11 pin/disc mortised unit, high security pick proof and drill resistant in accordance with UL 437 standard, restricted and registered keyway, suitable for masterkeying and grandmasterkeying all buildings of project into one system for entire site.
  - (1)** Acceptable Products:
    - (A)** Sargent Keso F1 UL437
    - (B)** Abloy Protec2 UL437
- (l)** Finish: stainless steel on exterior and humid areas.
- (m)** Butts and hinges: to ANSI/BHMA A156.1, minimum 2 ball bearing type for all doors, 4 ball bearing type or continuous hinge on heavy weight and high use doors, size and number of hinges per door to suit door type.
  - (1)** Provide non removable pins on all outswinging doors.
- (n)** Electric Hinge: heavy duty high quality grade, long life, maintenance free hinge as proven in use, concealed switch or monitoring device purposely suited as required to function with electrical or electronically operated hardware item.
- (o)** Surface mounted or exposed power transfer armoured door loop devices are not acceptable.
- (p)** Electric strike: to ANSI/BMHA A156.5 and A156.31, heavy duty grade 1, mortised design, and as follows:
  - (1)** All stainless steel body and parts, tamper resistant, minimum opening force resistance of 10.7 KN, tested to meet 2,000,000 cycles of operation.
  - (2)** Function: fail secure type for most locations; fail safe type in conditions where the locking device is locked on both sides of door and does not provide immediate free egress except by key. Use fail safe only when directed by Departmental Representative.
  - (3)** Voltage: to suit access control system.
  - (4)** Monitoring: Latch bolt and strike monitor option as deemed required to suit building security system
  - (5)** Provide stainless steel protective lock guard plate with tamper proof through-bolt fasteners for all exterior strikes and for interior strikes where security or detention may be compromised.
  - (6)** Acceptable Products: HES 1006 Series, Folger Adams
- (q)** Door Closers and door control devices: to ANSI/BHMA A156.4, heavy duty grade 1, fully adjustable from size 1 to 6 to meet all barrier free conditions, complete with arms and brackets as required.
  - (1)** Acceptable Products:
    - (A)** Exterior/Interior Vestibule and High Traffic Doors: Sargent 351 series, LCN 4000 series
    - (B)** Other Doors: Sargent 1410 series, LCN 1400 series
- (r)** Power Operated Door Operator: to ANSI/BHMA A156.19, heavy duty grade, designed for high use and exterior windy conditions when applicable.
- (s)** Power supply shut-off switch for exterior and vestibule doors to be done by key switch masterkeyed into the building's keying system.

- (t) Exit Devices: to ANSI/BHMA A156.3, heavy duty grade 1, modern design push pad, of function as stated in schedule, exterior trim when specified to be lever of same design to match locksets, equipped with breakaway feature, all dogging of push pad when specified to be done by cylinder dogging, all exterior and interior vestibule doors and high use doors to have stainless steel 630 finish.
  - (1) Acceptable Products: Sargent 80 Series, Von Duprin 98/99 Series
- (u) Protective Plates: Provide kick plate, mop plate or armour plate as recommended by DHI best practises for application on doors of vestibules, corridors, washrooms and other doors subject to damage.
- (v) Sound Seals: for STC rated rooms and other locations as per Room Data Sheet.
  - (1) Accepted Products: KNC# W-16N with W-21 Self-Adhesive Seal
- (w) Jamb & Head Gasketing: commercial quality, adjustable type, neoprene gasket, suitable design to achieve STC rating.
- (x) Bottom Seal: automatic drop seal, recessed into rebated door edge, adjustable with felt insert for carpet areas and over thresholds, neoprene insert for sheet or smooth surface flooring.
- (y) Threshold: extruded aluminum, barrier free design of maximum 12 mm height.

**3.16.9. Fastenings**

- (a) Supply screws, bolts, expansion shields and other fastening devices required for satisfactory installation and operation of hardware.
- (b) Exposed fastening devices to match finish of hardware.
- (c) Use fasteners compatible with material through which they pass.

**3.16.10. Keying**

- (a) Locksmiths shall be security cleared by Departmental Representative and CBSA to Protected B level. Contractor shall provide company name, name of installers and other pertinent information to Canada in advanced. Canada will not be responsible for any extra cost as a result of their inability to clear any security requirements.
- (b) Doors to be keyed differently, Masterkeyed and Grandmaster keyed such that all buildings of this project are tied into one keying system. Prepare a detailed keying schedule in conjunction with the Departmental Representative prior to proceeding with keying.
- (c) Provide two (2) keys for every lock in this Contract. Provide two (2) keys for every Masterkey groups for the Grandmasterkey.
- (d) Construction keying: perimeter doors of all buildings to be controlled by a temporary key system during construction.
- (e) Supply 3 copies of construction keys to Departmental Representative for his use.
- (f) Restrict distribution and control of other copies of construction key to limited personnel as approved by Departmental Representative.
- (g) Stamp keying code on keys and cylinders barrels. Do not stamp codes on cylinder face.
- (h) Turn over all final cut keys, complete with keying schedule as one package, directly to Departmental Representative.
- (i) Supply key control system complete with lockable key box, control tags and register. Size system to be expanded by 50% in future.
- (j) Installation Instructions

- (1) Furnish metal door and frame manufacturers with complete instructions and templates for preparation of their work to receive hardware.
- (2) Furnish manufacturers' instructions for proper installation of each hardware component.
- (3) Install hardware to standard hardware location dimensions in accordance with Canadian Metric Guide for Steel Doors and Frames (Modular Construction) prepared by Canadian Steel Door and Frame Manufacturers' Association.

#### **3.16.11. Quality Control**

- (a) Quality Control: use only qualified installers having knowledge and past experience in door hardware installation.
- (b) Upon request, submit written affidavit of worker qualifications and past experience.
- (c) Coordinate the supply and installation of door hardware with the building security system and with the electrical door access control system being provided by other subContractors on project.
- (d) Ensure use of correct locking function and appropriate electric strike on doors equipped with proximity card readers.
- (e) Provide all labour as required to assist in the installation of security door control access system and ensure that no operational conflicts exists between the door hardware and the access control system.
- (f) Site Inspection Service
  - (1) Prior to interim inspection, obtain and pay for the services of a Hardware Representative from the finish hardware supplier to visit project site and inspect all installed hardware.
  - (2) Representative must be a qualified architectural hardware consultant (AHC).
  - (3) Inspection to include verification that:
    - (A) All hardware of each door, including door closure, have been installed correctly and operates efficiently as intended;
    - (B) Sound gasketing and automatic door bottom operate properly and create good sound seal and;
    - (C) Correct lockset function is installed on each door.
    - (D) Make hardware adjustments as recommended by Hardware Representative during his presence on site.
    - (E) Hardware Representative to submit written report to Departmental Representative certifying that all hardware is installed and operates correctly. Include in report deficiencies found during inspection(s) and indication that they have been corrected.
    - (F) Conduct sufficient quantity of site inspections as needed to report satisfactory installation of all hardware.
- (g) Schedule of Hardware Sets: see Schedule of Hardware Sets and Conceptual Architectural Drawings for door type and locking function.
- (h) Develop door hardware schedule following BHMA standard practises and format.

#### **3.17. GYPSUM BOARD**

- 3.17.1.** Standard board: to CAN/CSA-A82.27, mold and moisture resistant 15.9 mm thick and fire rated board mold and moisture resistant 15.9 mm thick, 1200 mm wide x maximum practical length, ends square cut, edges bevelled.
- 3.17.2.** Unless required to achieve a specific fire rating, gypsum board shall be a minimum 12.7 mm thick installed to CSA A82.31 with all necessary accessories.
- 3.17.3.** Exposed plastic or metal J-mould casing are not acceptable.
- 3.17.4.** Gypsum board shall contain a reasonable percentage of recycled material. Reference Environmental Choice Program (ECP), guideline ECP-50 to determine reasonable percentage of recycled material. All new joint compounds shall be low in VOC and shall not contain any antifreeze, biocide or pesticide agents.
- 3.17.5.** Water resistant board: to ASTM C 630 (reference was CAN/CSA A82.27), regular, 15.9 mm thick, 1200 mm wide x maximum practical length.
- 3.17.6.** Accessories:
  - (a)** Metal furring runners, hangers, tie wires, inserts, anchors: to CSA A82.30, galvanized.
  - (b)** Drywall furring channels: 0.5 mm core thickness galvanized steel channels for screw attachment of gypsum board.
  - (c)** Resilient drywall furring: 0.5 mm base steel thickness galvanized steel for resilient attachment of gypsum board.
  - (d)** Nails, screws and staples: to CAN/CSA-A82.31.
  - (e)** Stud adhesive: to CAN/CGSB-71.25.
  - (f)** Laminating compound: as recommended by manufacturer, asbestos-free.
  - (g)** Casing beads, corner beads, control joints and edge trim: to ASTM C 1047, zinc-coated by hot dip process, Metal, 0.5 mm base thickness perforated flanges; one piece length per location.
  - (h)** Joint compound: to CAN/CSA-A82.31, asbestos-free.
- 3.17.7.** Standard of Quality of Gypsum Board Finish:
  - (a)** Surfaces not exposed to view (GA-214): Provide a Level 4 finish. Joints and interior angles shall have tape embedded in joint compound. Surface to be free of excess joint compound. Minor tool marks and ridges are acceptable. Where fire resistance rating is required for assembly, details of construction shall be in accordance with reports of fire tests of assemblies that have met the fire rating requirements.
  - (b)** Surfaces exposed to view (GA-214): Provide a Level 4 finish. Joints and interior angles shall have tape embedded in joint compound and three separate coats of joint compound applied over all joints, angles, fastener heads, metal beads and trim. Joint compound shall be smooth and free of tool marks and ridges.
  - (c)** Critical surfaces exposed to view (GA 214): Provide a Level 5 finish where gloss or semi-gloss paints are specified or where critical lighting conditions occur on satin, flat or low sheen paints.
  - (d)** Surfaces shall be dust-free and ready for painting.

### 3.18. ACOUSTIC INSULATION

- 3.18.1.** All walls shall be insulated with Acoustic Batt Insulation and shall exceed CAN/ULC-S702-97; Mineral Fibre Thermal Insulation in Buildings, (Type 1-unfaced).

### 3.19. TILEWORK

#### 3.19.1. General Requirements:

- (a) Do tile work in accordance with Terrazzo Tile and Marble Association of Canada (TTMAC):
  - (1) Tile Specification Guide 09300, Tile Installation Guide
  - (2) Tile Maintenance Guide
- (b) Carefully plan layout of tile to provide a symmetrical pattern uninterrupted throughout doorways. Perimeter tile to be minimum one-half size.
- (c) Neatly cut tile around fitments, fixtures and drains.
- (d) Provide control joints where required.
- (e) Apply sealers in accordance with manufacturer's written instructions.
- (f) Provide a minimum of 2 field colours and 2 accent colours for each tile. Allow for a minimum of 15% accent tile in patterning.
- (g) Tile to exceed CAN/CGSB-75.1-M88.

- 3.19.2.** Wall tile: Glazed, Ceramic to CAN/CGSB-75.1, Type 5 (wall tile, interior), Class MR 4, smooth surface.

- 3.19.3.** Floor tile: Ceramic to CAN/CGSB-75.1, Type 4 (quarry tile), Class MR 2, matt slip resistant surface.

#### 3.19.4. Rooms with Showers

- (a) Uncoupling Membranes:
  - (1) Schluter®-DITRA Description: 3 mm thick, orange, high-density polyethylene membrane with a grid structure of 12 mm x 12 mm square cavities, each cut back in a dovetail configuration, and a polypropylene anchoring fleece laminated to its underside. Conforms to definition for uncoupling membranes in the Tile Council of North America Handbook for Ceramic Tile Installation; and meets or exceeds the requirements of the "American national standard specifications for load bearing, bonded, waterproof membranes for thin-set ceramic tile and dimension stone installation A118.10," and is listed by cUPC®, and is evaluated by ICC-ES (see Report No. ESR-2467).
  - (2) Provide Adhesive as recommended by manufacturer.
  - (3) Waterproofing Membranes:
  - (4) Schluter®-KERDI Description: 0.008 inch (0.2 mm) thick, orange polyethylene membrane, with polypropylene fleece laminated on both sides, which meets or exceeds the requirements of the "American national standard specifications for load bearing, bonded, waterproof membranes for thin-set ceramic tile and dimension stone installation A118.10," and is listed by cUPC®, and is evaluated by ICC-ES (see Report No. ESR-2467).
  - (5) Provide Adhesive as recommended by manufacturer.

- 3.19.5.** Trim, washroom tile:

- (a) Wall tile: cove base, complete with external corners; radiused/bullnosed edge trim at outside corners and where tile terminates at locations other than abutting surfaces.
- (b) Floor tile: cove base, complete with external corners.

**3.19.6.** Maintenance Material: 5% overage or minimum 1 carton for each type, colour and pattern of tile.

**3.19.7.** Tile sealer: penetrating type, breathable, not affected by solvent based strippers or cleaners. Use as recommended by tile manufacturer.

**3.19.8.** Floor sealer and protective coating: to tile and grout manufacturers' recommendations.

**3.19.9.** Mortar and Adhesives

- (a) Portland cement: to CSA-A5, type 10.
- (b) Sand: to ASTM C144, passing 16 mesh.
- (c) Hydrated lime: to ASTM C207, Type N.
- (d) Latex additive: formulated for use in Portland cement mortar and thin set bond coat.
- (e) Water: potable and free of minerals and chemicals which are detrimental to mortar and grout mixes.
- (f) Dry set mortar: to ANSI A118.1.

**3.19.10.** Grout

- (a) Exceed ANSI A118.8, modified epoxy emulsion mortar and grout, colour as selected.
- (b) Grout preparation to manufacturer's instructions.

**3.19.11.** Thresholds: marble, 12 mm thick, rounded edges two sides, honed finish to expose surfaces, size to suit door opening and frame width.

**3.19.12.** Sealant: acrylics one part, mildew resistant, in accordance with Sealants Section.

## 3.20. RESILIENT FLOORING

**3.20.1.** General Requirement

- (a) Linoleum Sheet Flooring: composed of natural ingredients which are mixed and calendered onto a jute backing, installed with welded joints.
- (b) To meet Ecologo CCD 152 D
- (c) Thickness: 3.2 mm
- (d) Pattern and colour: to be selected by the Departmental Representative from a standard range.
- (e) Smoke Density to ASTM E662-450 or less.
- (f) Static Load to ASTM F970-31.65 kg/cm.
- (g) Meets or exceeds ASTM F2034.
- (h) Critical Radiant Flux to ASTM E648-Class 1.
- (i) Maintenance material: 5% of coverage area.

**3.20.2.** Base: Type 1: Linoleum, 100mm integrated cove base. Type 2 – 100mm rubber base.

**3.20.3.** For all LAN Rooms, provide anti-static flooring complete with grounding strips connected to grounding source.

### 3.21. CARPET

#### 3.21.1. References

- (a) CAN/CGSB-4.129-93, Carpets for Commercial Use.
- (b) CAN/ULC-S102.2-2003, Surface Burning Characteristics of Flooring, Floor Covering and Miscellaneous Materials and Assemblies.
- (c) Carpet and Rug Institute (CRI)
  - (1) CRI TM101 – 03 Assessment of Carpet Surface Appearance Change
  - (2) CRI TM 102 – Fluorochemical Finishes
  - (3) CRI 104 – 02 Standard Installation of Commercial Carpet
  - (4) IAQ – Indoor Air Quality Carpet Testing Program.
- (d) American Society for Testing and Materials (ASTM).
  - (1) ASTM D 1335-03 Tuft Bind of Pile Floor Coverings.
  - (2) ASTM D 3936-02, Standard Test Method for Resistance to Delamination of the Secondary Backing of Pile Yarn Floor Covering.
  - (3) ASTM D5848-05 Standard Test Method for Mass Per Unit Area of Pile Yarn Floor Coverings.
- (e) American Association of Textile Chemists and Colorists (AATCC).
  - (1) AATCC 16E-2004, Color Fastness to Light.
  - (2) AATCC 134-2001, Electrostatic Propensity of Carpet.
  - (3) AATCC 174-1998, Antimicrobial Activity Assessment of Carpets.
  - (4) AATCC 175-2003, Stain Resistance: Pile Floor Coverings.
  - (5) AATCC 189-2002, Fluorine Content of Carpet Fibers.

#### 3.21.2. Submittals

- (a) Submit in accordance with General Requirements.
- (b) Submit product data sheets for carpet tile, adhesive concrete floor filler and sealer including:
  - (1) Physical and performance test results, labelling and certifications
  - (2) Certificate demonstrating compliance with CAN/ULC S102.2
  - (3) Written proof of testing and compliance with the Indoor Air Quality (IAQ) Carpet Testing Program requirements of CRI
  - (4) Manufacturer's guarantee
  - (5) Verification of recycled content and/or recyclability
  - (6) Carpet size, pattern and colours
  - (7) Manufacturer's installation instructions
- (c) WHMIS MSDS – Material Safety Data Sheets acceptable to Labour Canada and Health and Welfare Canada for primers, levellers and adhesives. Indicate VOC content.
- (d) Submit samples of each type, minimum sizes;
  - (1) Carpet tile, 250 mm x 250 mm

- (2) 150 mm long divider/transition strips
- (e) Submit maintenance data, include:
  - (1) Maintenance procedures and recommendations for maintenance materials and equipment.
  - (2) Suggested schedule for cleaning.

**3.21.3. Quality Assurance**

- (a) Qualifications: certified by manufacturer to install carpet tile.

**3.21.4. Warranty**

- (a) Contractor shall provide a total of 24 months warranty in addition to the 12 month prescribed in subsection GC 3.12 of the General Conditions.

**3.21.5. Manufacturer's Guarantee**

- (a) Provide a minimum fifteen (15) year non-prorated labour and material carpet manufacturer's guarantee issued in the name of her Majesty the Queen in right of Canada, to cover, without the use of chair pads and allowing traffic immediately upon carpet installation the following:
  - (b) Maximum 15% loss of pile fiber weight tested as per ASTM D5848, mass per unit, area of pile yarn, floor coverings.
  - (c) Maximum 10% loss of secondary backing resiliency calculated using average thickness.
  - (d) No edge ravel, zippering or delamination of secondary backing.
  - (e) Manufacturer's Guarantee to start from the date of issue of Final Certificate of Completion.

**3.21.6. Scheduling and Protection**

- (a) Install carpet only after all work of other trades has been finished in the area concerned and no more construction traffic is anticipated. Where prevention of tracking of dirt is impossible, provide protective covers as specified.

**3.21.7. Maintenance Data**

- (a) Provide maintenance data for carpet maintenance for incorporation into Operation and Maintenance Manual.

**3.21.8. Delivery and Handling**

- (a) Label packaged materials.
- (b) Store packaged materials in original containers or wrapping with manufacturer's seals and labels intact.
- (c) Prevent damage to materials during handling and storage. Keep materials under cover and free from dampness.
- (d) Maintain temperature of store room at a minimum of 20° C, for at least 24 hours immediately before the installation.

**3.21.9. Environmental Requirements**

- (a) Provide continuous temporary ventilation during carpet installation in order to accelerate carpet off-gassing and to exhaust fumes and odours, emitted from

carpet and adhesives, to the exterior. Maintain ventilation during entire carpet installation period and for 72 hours thereafter.

- (b) Coordinate use of building ventilation system with Engineer to operate at 100% exterior exhaust/fresh air intake during carpet work.
- (c) Ensure exhaust system is operating as intended before commencement of carpet work and that system is re-adjusted and returned to normal operations thereafter.
- (d) Additionally, provide fans, in sufficient quantity as required, to assist the ventilation process and remove all fumes, odours and off-gassing as quickly as possible from the building interior. In particular, ventilate small rooms, alcoves and enclosed spaces.
- (e) Perform carpet work of each work phase in a continuous period to minimize inconvenience to building Facility due to ventilation.
- (f) Where fumes and odours cannot be satisfactorily removed from the building interior, perform carpet work during weekend off-hour workshifts.
- (g) Safety: Comply with requirements of Workplace Hazardous Materials Information System (WHMIS) regarding use, handling, storage, and disposal of hazardous materials.

#### **3.21.10. Extra Materials**

- (a) Provide 5 m<sup>2</sup> of each colour, pattern and type of carpeting.
- (b) Extra materials to be from same production run as installed materials.
- (c) Identify each package of carpet.
- (d) Store on site where directed by Departmental Representative.

#### **3.21.11. Manufacturers**

- (a) Certified to Carpet and Rug Institute's and IAQ requirements.
- (b) Have an on-going in-plant sustainable and recycling program in place.

#### **3.21.12. Carpet Tile**

- (a) Carpet: to CAN/CGSB-4.129 and as follows:
  - (1) Certified for flammability to Health Canada regulations under "Hazardous Products (Carpet) Regulations", Part II of the Schedule.
  - (2) Maximum flame spread rating of 300 and maximum smoke developed classification of 500 when tested to CAN/ULC-S102.2
  - (3) Certified to Carpet and Rug Institute's IAQ requirements and bear CRI-IAQ Label.
- (b) Construction:
  - (1) Tufted method, level loop, textured as selected by Engineer.
  - (2) Finished Pile Height: minimum 2.4 mm, maximum 5.0 mm.
  - (3) Secondary backing: manufacturer's
  - (4) Tuft bind: minimum 35N, wet and dry, tested to ASTM D-1335.
  - (5) Average Pile Yarn Density: minimum 222 kg/m<sup>3</sup> (6,000 oz/yd<sup>3</sup>).
- (c) Yarn Type: 100% branded nylon, bulk continuous filament, Type 6 or 6.6 with permanent conductive fibers to control electrostatic propensity.
- (d) Size: square tile, nominal 500 x 500 mm +/- 8%
- (e) Dye Method: minimum 70% solution dyed, maximum 30% yarn dyed.

- (f) Performance:
  - (1) Appearance Retention Rating: minimum value of 3.0 to CRI Grading as per Test Method 101.
  - (2) Static control: to AATCC 134, maximum of 3.0 KV at 20% RH and 22°C, incorporated into carpet by permanent means and without chemical treatment.
  - (3) Delamination: minimum 8.5 N/cm (5.0 lbs/inch) to ASTM D-3936.
  - (4) Colourfastness to light: to AATCC 16E, minimum rating of 4.0 after 40 hours.
  - (5) Soil Resistance: minimum 350 parts/million fluorine, Fluorine Durability Level to AATCC 189
  - (6) Stain resistance: to AATCC 175, minimum rating of 6.
  - (7) Anti-microbial: to AATCC 174, 99% reduction, 0% growth.
  - (8) Dimensional Stability: maximum 0.2% to DIN STD. 54318-AACHEN test
  - (9) Toxicity: pass CRI IAQ Testing Program Green Label Plus.
  - (10) Pattern and colour: as selected by Engineer from manufacturer's full range in accordance with following design scheme:
    - (A) Patterning: textured loop with striated design pattern. No pin-dot design.
    - (B) Colour and pattern selected by Engineer from manufacturer's standard full range.
    - (C) Two (2) colours will be chosen as follows:
      - (i) Colour #1: 70% of total carpet required
      - (ii) Colour #2: 30% of total carpet required
- (g) Maintenance material: 5%

### 3.21.13. Recycled Content

- (a) Postconsumer and preconsumer as defined in US EPA Comprehensive Procurement Guidelines.
- (b) Recyclable as defined in FTC Part 260 – Guidelines for the use of Environmental Marketing Claims, Section 260.7(d).
- (c) Percentage by weight of recovered material, calculated by dividing weight of recovered materials content in one square unit of area of finished carpet (consisting of pile, backing, and attached cushion, if any) by total weight of one square unit of area of finished carpet, and multiplying by 100.
- (d) Comply with at least one of the following three requirements:
  - (1) Product contains a minimum 5% by weight of postconsumer materials recycled content, except that vinyl-backed and other similar hard-backed products contain 20% by weight of postconsumer materials recycled content.
  - (2) Product contains a minimum 15% by weight of recovered materials (which includes both preconsumer and postconsumer materials).
  - (3) Product contains a minimum 25% by weight of recyclable content and a recycling program is in place and operational.

### 3.21.14. Accessories

- (a) Wall base: as identified in room finish schedule.

- (b) Adhesive: releasable or peel and stick, mill applied, low odour/low VOC complying with CRI IAQ testing program requirements and criteria.
- (c) Select adhesive based on the lowest level of chemical emissions released during application and curing. Where more than one adhesive is suitable and the emission rates are similar, use the adhesive of least toxic or irritant to humans.
- (d) Concrete Floor Sealer and Primer: as recommended by carpet tile manufacturer.

**3.21.15. Transition strips**

- (a) Vinyl type with lip to extend under floor finish, cap both sides over top of adjacent floor finishes. Cap height to suit floor finish height and accommodate underside of door clearance. Colour selected from manufacturer's full colour range.
- (b) Carpet protection: non-staining heavy duty kraft paper.
- (c) Subfloor filler and leveller:
  - (1) Purpose made Portland cement based polymer modified compound, capable of achieving minimum compressive strength of 30 MPa once cured, mixed on site with latex liquid additive and water.
  - (2) Capable of achieving a feather edge.
  - (3) Specifically formulated as a high impact traffic topping and levelling material, non-dusting type.
  - (4) Low odour/low VOC content
  - (5) Compatible with carpet tile flooring
  - (6) Use of gypsum based levellers are not acceptable.

**3.21.16. Preparation**

- (a) Ensure temporary ventilation is in place during sub-floor preparation and carpet installation.
- (b) Prepare floor surfaces in accordance with recommendations of CRI-104 and to manufacturer's printed instructions.
- (c) Sweep and vacuum floors after patching and cleaning to remove all grit and debris. Do not use oil-based sweeping compounds.

**3.21.17. Installation**

- (a) Install carpet tiles in accordance with manufacturer's printed instructions and in accordance with recommendations of the Carpet and Rug Institute.
- (b) Install tiles using minimum number of cut tile. Layout out in a balanced appearance. Pre-plan location of accent tiles and patterns.
- (c) Obtain Departmental Representative's approval when deviations from drawings or directives are needed during installation.
- (d) Install carpeting after finishing work is completed but before office workstations and power/communication outlets are installed.
- (e) Finish installation to present smooth wearing surface having tight butt joints between tiles, without conspicuous seams, burring and other faults.
- (f) Use material from same dye lot. Ensure colour, pattern and texture match within any one visual area. Maintain constant direction as directed.
- (g) Fit neatly around architectural, mechanical, electrical and telephone outlets, and furniture fitments, around perimeter of rooms into recesses, and around projections.

**3.21.18.** Protection of finished work

- (a) Vacuum carpets clean immediately after completion of installation. Protect traffic areas.
- (b) Prohibit traffic on carpet until adhesive is cured.
- (c) Install carpet protection where work must continue over finished carpet.

**3.22. SUSPENDED ACOUSTICAL TILE CEILINGS**

**3.22.1.** General Requirement

- (a) Suspension system: to ASTM C635-91, exposed grid system, heavy duty main tee, intermediate cross tee.
- (b) Finish: flat white to match acoustic panels.
- (c) System to be complete with angle-shaped wall moulding, hangers and accessories as required for complete system.
- (d) Maintenance material: 5% full length support grid.

**3.22.2.** Typical Acoustical tiles

- (a) To CAN/CGSB-92.1-M89, non-combustible, mineral fibre, square edge, minimum NRC 0.65, minimum CAC 35 and minimum light reflectance 75%.
- (b) Size: 610 mm x 1220 mm
- (c) Maintenance material: 2% of each type of colour and min. two (2) cartons.

**3.22.3.** Washroom Acoustical tiles: to CAN/CGSB-92.1-M89, non-combustible, vinyl faced mineral fibre, square edge, minimum NRC 0.65, minimum CAC 35 and minimum light reflectance 75%.

- (a) Size: 610 mm x 1220 mm
- (b) Maintenance material: 2% of each type of colour and min. one (1) carton.

**3.22.4.** Install suspension system in accordance with ASTM C636; panels in accordance with Canadian Acoustical and Insulating Materials Association.

**3.22.5.** Suspension system and acoustical panels to be from one manufacturer.

**3.22.6.** Maximum deflection of suspended acoustical ceiling assembly: 1/360th of span to ASTM C635 deflection test.

**3.23. PAINTING & COATINGS**

**3.23.1.** General Requirement

- (a) This section includes Exterior and Interior Painting.
- (b) Follow Master Painters and Decorators Association of British Columbia (MPDABC) recommendations and procedures as listed in the MPDABC Architectural Painting Specification Manual for surfaces evaluation, surface preparation and paint application.

**3.23.2.** Select suitable paints following the MPI finish coating and formulae numbering system. Use only paint materials, including primers, as listed in the latest issue of the Approved Products List (APL) as published by Master Painters Institute.

- 3.23.3.** Select specific paint coatings for various exterior and interior substrate applications which are categorized as durable and excellent commercial/industrial grade quality by MPI. Use 3 paint coats, stipulated as "High Performance" or "Premium Grade" in the MPI finishing system, for all coating applications. However, number of paint coats specified above to be considered minimum requirements. Use appropriately tinted primers, particularly when dark colours are selected, and apply sufficient number of finish coats to fully hide substrate and provide uniform paint colour and finish.
- 3.23.4.** Security Block: For all security block such as corridors and cell areas, provide low VOC high performance MMA floor and epoxy wall complete with integrated cove. MMA floor shall be for high impact floor with seamless overlayment with no joints or seams to harbor dirt and is slip resistant. Prepare and provide substrate as per manufacturer's specifications.
- (a) Acceptable Products
- (1) Security Block Floor: MMA type coatings from BASF or Flowcrete
  - (2) Cell Walls, Ceiling and Others: High Performance Epoxy Paint/Block Filler appropriate to the dry/wet environment
- 3.23.5.** Use only qualified products with are "Environmentally Friendly", rated at minimum E2 and preferably E3, by MPI and which are water-borne or have the lowest possible VOC content without compromising quality and performance of the finish coating. Where several products meet the environmental rating specified, use one which has highest environmental characteristics but that does compromise quality and performance.
- 3.23.6.** Where special painting, coating or decorating system applications (example: elastomeric coatings) are to be used, paint or coating manufacturer shall provide as part of this work, certification of surfaces and conditions for specific paint or coating system application as well as on-site supervision and approval of their paint or coating system application as required at no additional cost to the Departmental Representative.
- 3.23.7.** Maintenance material: Provide two (2) full 3.7L cans of each colour used in the project.
- 3.23.8.** Submittals:
- (a) Submit manufacturer's technical product data for each primer and paint product proposed for use. Include within submittal the following:
    - (b) Product name, type and use.
    - (c) Manufacturer's product number.
    - (d) Colour numbers.
    - (e) MPI Environmentally Friendly classification system rating.
    - (f) Manufacturer's Material Safety Data Sheets (MSDS).
    - (g) Installation and application instructions.
  - (h) Submit manufacturer's full range colour sample chips to Engineer for colour selection and development of room colour chart prior to commencement of painting operations.
  - (i) Upon request provide proof, by means of purchase orders, invoices, receipts or other documents, that paint materials are supplied from those listed in MPI – Approved Product List.
- 3.23.9.** Application:

- (a) Stringently follow paint manufacturer's instructions and recommendations on suitable temperature, humidity and substrate moisture content levels and other stipulated environmental conditions for application of their paints.

**3.23.10. Qualifications:**

- (a) Paint Contractor shall have a minimum of five years proven satisfactory experience. When requested, provide a list of last three comparable jobs including, job name and location. Use only qualified journeymen who have a "Tradesman Qualification Certificate of Proficiency". Apprentices may be employed provided they work under the direct supervision of a qualified journeyman in accordance with trade regulations.

**3.23.11. Standard of Acceptance**

- (a) Walls: No defects visible from a distance of 1000 mm at 90° to surface.
- (b) Ceilings: No defects visible from floor at 45° to surface when viewed using final lighting source.
- (c) Paint all metal work as required in Section 3.0 – Metal Fabrications
- (d) Paint steel doors and frames as required in Section 13.0 – Steel Doors and Frames.
- (e) Final coat to exhibit uniformity of colour and uniformity of sheen across full surface area.

- 3.23.12. Disposal:** Paint and related materials (thinners, solvents, etc.,) are regarded as hazardous products and are subject to regulations for disposal. Treat leftover materials as hazardous waste. Handle and dispose of in accordance with governing regulations. Where paint recycling is available, collect waste paint materials by type and deliver to recycling facility.

**3.24. WASHROOM ACCESSORIES**

**3.24.1. General Requirement**

- (a) Accessories: commercial quality; stainless steel construction; meeting barrier-free requirements. Products to be of one manufacturer. Provide all applicable items for each of the public and staff washrooms.
- (b) Toilet paper dispensers: double roll type, surface mounted, stainless steel.
- (c) Feminine napkin disposals: stainless steel, continuous hinged door, self closing, surface mounted.
- (d) Grab bars: Stainless steel: 32 mm o.d. x 1.2 mm wall tubing of stainless steel, concealed attachment, provided with steel back plates and all accessories, anchored to withstand downward pull of 2.2 kN. Anti-slip finish.
- (e) Mirrors: sheet mirror to CAN/CGSB-12.5-M, Type 1A; one-piece, height to accommodate barrier free requirements x full width of counter top x 5 mm thick; complete with concealed stainless steel mounting clips and butyl tape. Maximum tolerance permitted from edge of wall is 13 mm on each side.
- (f) Soap dispensers: one hand operation, maximum force of 22.2 N to dispense soap, minimum 1.0 litre capacity.
- (g) Mounting: lavatory or countertop mounting. Ensure that mounting location provides easy access for under-counter soap container refill.

- (h) Waste receptacle: fully recessed, heavy gauge or reinforced stainless steel, removable galvanized steel or plastic waste receptacle, minimum waste capacity 45 litres minimum.
- (i) Paper towel dispenser: fully recessed professional hands free stainless steel hard roll hand towel dispenser integrated with waste receptacle.
- (j) Hand dryers: surface mounted, cast metal cover, high speed, hands free operation. To be provided in addition to the paper towel dispensers.
- (k) Shower curtain rod and approved curtain: 25 mm diameter x 1.2 mm wall thickness stainless steel tubing, c/w flanges, curtain and stainless steel curtain hooks.
- (l) Robe hook: stainless steel, two in each of the water closet stalls and showers.
- (m) Diaper change table: wall mounted retractable. Applies to the Accessible Public Washroom.

**3.24.2.** Ensure adequate support in walls for accessories.

**3.24.3.** Ensure wall framing is installed to accept fully recessed units.

### 3.25. MISCELLANEOUS SPECIALTIES

**3.25.1.** Metal Lockers: Steel, single, full-height to CAN/CGSB44.40; Locker count: 12 units. Location is shown in the Conceptual Drawings.

- (a) Size: 458 mm wide x 458 mm deep x 1829 mm high, top sloped to 45 degrees.
- (b) Material: hinges 14 ga., frame 16 ga, door 20 ga, top 22 ga and back and sides 24 ga.
- (c) Prepainted, knocked down pop riveted construction complete with all trim pieces.
- (d) Doors: swing out door of one-piece double-wall envelope construction.
- (e) Door handle: recessed steel handle with bright chromium finish.
- (f) Locking system: padlocks.
- (g) Finish ends to match fronts where lockers are exposed.
- (h) Unobstructed ventilation through two sets of louvers.
- (i) Install one shelf, one hanger rod and two coat hooks per locker.
- (j) Assemble and install lockers in accordance with manufacturer's written instructions.
- (k) Provide canvass or vinyl duffle bag, measuring 300 mm x 300 mm x 600 mm, with hook, inside of each locker.

**3.25.2.** Storage at Covered Inspection Lane

- (a) Provide two 36"W x 48"L x 96"H shelving made with galvanized metal struts and 1" exterior grade plywood complete with metal enclosure and commercial locks. Shelving shall be rated for 1000 lbs with approximately 36" high spacing. Manufactured metal cabinets with similar capacity and minimum storage areas are also acceptable.

**3.25.3.** Flat Panel TV Mount – One full motion articulating ceiling mount designed for 42"-60" Flat Panel TV rated for minimum 120 lbs and can extend greater than 20" out from the ceiling/wall.

**3.25.4.** Staff Kitchenette Appliance

- (a) One Energy Star 1.2 cu. ft. mid-size genius inverter stainless steel microwave oven built into millwork.
- (b) One Energy Star bottom mount stainless steel refrigerator min. 36" wide x 24" deep with no internal water.
- (c) One black or stainless steel ceramic electric cooktop with maximum two burners. One burner shall be 2500 watts minimum.

**3.25.5. Recessed Entry Matt**

- (a) Entry Mat: Primary outdoor matting as part of a staged system intended to remove soil and debris from foot traffic. Surface mounted rail matting complete with extruded aluminum tapered edging. The mat size shall be the same size as the entry vestibule.
- (b) Frame: TA - Surface Mounted Aluminum Frame shall be a 1 5/8"(38.1mm) wide 6105-T5 aluminum alloy and permanently positions mat for surface mounted applications. Frame color shall be supplied in mill (standard) or one of 9 optional colors as offered by manufacturer. Anodized or heavy-duty powder coat finish. Note: Mill finish frames in contact with concrete to be primer coated.
- (c) Tread Insert: HD - MonoTuft HD™ Carpet shall meet CRI standard for good indoor air quality. Fibers shall include a minimum of 100, 12 mil monofilament fibers per square inch available in one of 21 standard colors as offered by manufacturer. Each carpet fiber and monofilament shall be fusion-bonded to a rigid two-ply backing to prevent fraying and supplied in continuous splice-free lengths. Anti-static carpet fibers shall contain antimicrobial additive and be treated with Scotchgard® to reduce soiling. Carpet weight shall be 33-oz./yd<sup>2</sup>.
- (d) Acceptable Product: "Pedimat (M1)" as manufactured by CS Construction Specialties.

**3.25.6. Building Evacuation Plan**

- (a) Provide building evacuation plans and fire evacuation maps mounted on the wall to current Code requirements.

## **4.0 STRUCTURAL PERFORMANCE SPECIFICATIONS**

### **4.1. REFERENCE CODES, STANDARDS AND GUIDELINES**

- 4.1.1.** The structural system for this facility shall be designed by a Professional Engineer licensed to practice in British Columbia in conformance with all federal, provincial and municipal laws and regulations. The design shall conform to the National Building Code and all of the referenced codes, standards and guidelines contained therein.

### **4.2. REFERENCE DRAWINGS AND DOCUMENTS**

- 4.2.1.** Work shall be in accordance with the requirements of this section and must also be coordinated with the requirements of the other disciplines, particularly the architectural general requirements and drawings.

### **4.3. GENERAL STRUCTURAL REQUIREMENTS**

- 4.3.1.** Refer to the architectural performance requirements for a description of design intent regarding the areas of the Main Building and Covered Inspection Lane having high ceiling areas. Ideally, there would be no free standing columns in the spaces below the exposed structure as they would impact on the function and flexibility of these rooms.
- 4.3.2.** Floor & Roof framing systems
- (a) If metal deck on open web steel joists system is selected, the OWSJ depth need to be deeper than the minimum requirements to allow secondary ducts to pass through the joists. All metal deck , joists, beam and column need to have fire proofing to meet required rating Steel decking is mechanically fastened to the joists and beams rather than welding, allowing work to be completed in all weather conditions.
- 4.3.3.** Lateral load – resisting system
- (a) The seismic and wind forces on the building are resisted by the flexible roof diaphragm, the rigid floor diaphragm, and by either structural steel brace or shear wall which transfer the forces to the foundation with defined load paths.
- 4.3.4.** Considerations shall be taken to support system equipment, such as anchorage requirements.

## 5.0 MECHANICAL PERFORMANCE SPECIFICATIONS

### 5.1. REFERENCE CODES, STANDARDS AND GUIDELINES

**5.1.1.** The mechanical systems for this facility shall be designed by a licensed Professional Engineer in conformance with all federal, provincial and municipal laws and regulations and shall conform to the latest edition or revision of the codes and standards of the following technical associations and organizations:

- (a) AABC – American Air Balance Council
- (b) AMCA – Air Moving and Conditioning Association
- (c) ANSI – American National Standard Institute
- (d) ASHRAE – American Society of Heating, Refrigeration and Air Conditioning Engineers
- (e) ASME – American Society of Mechanical Engineers
- (f) ASTM – American Society for Testing and Materials
- (g) ARI – Air Conditioning and Refrigeration Institute
- (h) CSA – Canadian Standards Association
- (i) CGSB – Canadian Government Standards Branch
- (j) MSS – Manufacturers Standard Society of the Valve and Fittings Industry
- (k) NBC – National Building Code
- (l) NFC – National Fire Code
- (m) Model National Energy Code of Canada for Buildings 1997
- (n) NFPA – National Fire Protection Association
- (o) NPC – National Plumbing Code
- (p) NRC – National Research Council of Canada
- (q) SMACNA – Sheet Metal and Air Conditioning Contractors National Association Inc.
- (r) TIAC – Thermal Insulation Association of Canada
- (s) ULC – Underwriter’s Laboratory of Canada
- (t) CEPA 1999- Canadian Environmental Protection Act
- (u) BCSA – BC Safety Authority (Boilers, Refrigeration Systems, Pressure Vessels, Propane Systems)
- (v) WSBC/WCB – Work Safe BC

### 5.2. REFERENCE DRAWINGS AND DOCUMENTS

**5.2.1.** Design shall be based on the information contained in this specification and room data sheets in the Appendices. Design shall also be coordinated with Site Services, Architectural, Structural, and Electrical specifications, data sheets and drawings.

### 5.3. SITE SERVICES MECHANICAL

**5.3.1.** The Mechanical work will commence 1.5 meters from the outside wall of the building.

### 5.4. GENERAL MECHANICAL REQUIREMENTS

- 5.4.1.** The Contractor shall include all design, documentation, labour, materials and equipment required for design, installation, testing and commissioning of mechanical systems as detailed in all sub-sections of this Mechanical Performance Specification.
- 5.4.2.** The Contractor is advised that the requirements of the proposed mechanical systems described in this performance specification represent one approach only. The Contractor without limiting his/her ingenuity or utilization of his/her experience and abilities shall incorporate as a minimum the intent of these preferences into the mechanical systems designs.
- 5.4.3.** Existing Conditions: Investigate the site, existing buildings, structures and local conditions affecting work under this contract. Coordinate with the Civil, Architectural, Structural and Electrical Engineering design, specification and drawings to ensure work can be performed in a seamless manner without changes to the approved building designs/drawings.
- 5.4.4.** Site Service Information: Obtain and verify the location, routing and depth of site services from the civil engineer, including sanitary and storm sewers, water mains, propane, and electrical services. .
- 5.4.5.** Roof mounted mechanical equipment will not be permitted
- 5.4.6.** No overhead services can be above LAN Rooms, telecommunications rooms, cells, arming rooms, electrical rooms and other critical areas. Avoid equipment requiring maintenance over boardrooms, training rooms, executive offices, or other defined critical areas.
- 5.4.7.** The premises shall meet the following noise criterion (NC) levels unless otherwise specified in the Room Data Sheets:
- |     | Area                        | RC (N) Range (dB re 20 micropascals) |
|-----|-----------------------------|--------------------------------------|
| (a) | Executive Offices           | 25-30                                |
| (b) | Private Offices             | 30-35                                |
| (c) | General Offices             | 35-40                                |
| (d) | Conference/Meeting Rooms    | 25-35                                |
| (e) | Training Rooms              | 25-35                                |
| (f) | Computer Rooms              | 40-45                                |
| (g) | Libraries                   | 30-45                                |
| (h) | Halls, Corridors, Lunchroom | 40-45                                |
| (i) | Locker Rooms/Washrooms      | 40-45                                |
- 5.4.8.** Noises shall be free from annoying, recognizable characteristics such as rumble, hiss, tones and variability of noise patterns.
- 5.4.9.** Obtain approval from the Departmental Representative before commissioning systems and putting into service. System commissioning shall be performed in the presence of the Departmental Representative and the building operating personnel and shall follow the commissioning procedures set out in the General Requirements.
- 5.4.10.** Contractor shall coordinate with the local utilities and/suppliers for connection and disconnection of mechanical services to the new facility.

- 5.4.11.** Permits and Regulations: Obtain all regulatory permits and pay all fees for performing the work based on the approved and Issued for Construction drawings.
- 5.4.12.** Review approved drawings with the Departmental Representative and authorities having jurisdiction to ensure compliance with all applicable codes and bylaws. Supply design calculations to verify that project requirements are satisfied.
- 5.4.13.** Execution of Design:
- (a) Refer to General Requirements for requirements relating to the execution of design and building commissioning.
  - (b) Heating and ventilation design load and energy use simulation calculations shall be carried out using a recognised and approved computerized load and energy calculation software. The results of the analysis shall be presented to the Departmental Representative.
  - (c) All drawings will be to the latest PWGSC CADD Standards.
- 5.4.14.** Execution of Work:
- (a) All buried pipe services shall be correctly backfilled, inspected, tested and approved prior to the pouring of concrete or similar work. Provide and set pipe sleeves as required.
  - (b) Group pipes and ducts neatly parallel to building lines while minimizing furring and size. Provide minimum clearance of 2.1m below all services. Make provisions for thermal expansion and contraction in piping systems. Pipes, ducts and equipment installed improperly shall be removed and replaced without cost to PWGSC.
  - (c) Provide metal nameplate on each piece of equipment, mechanically fastened complete with raised or recessed letters. Indicate system served, size, capacity and equipment rating. Identify piping to CGSB 24.3-92, identify medium by lettered legend classification, with primary and secondary colours and direction of flow arrows. Ductwork to have 50 mm stenciled letters and direction arrows.
  - (d) Incomplete duct work and piping shall be sealed to protect from ingress of dust and construction debris. Protect and maintain work until building has been completed and accepted. Protect work against damage during installation. Cover with tarpaulins if necessary. Repair all damage to floor and wall surfaces resulting from carrying out work, without expense to PWGSC
  - (e) During welding or soldering ensure structure is protected against fire.
  - (f) Coordinate work with other trades to avoid conflict and to ensure proper installation of all equipment.
- 5.4.15.** Field Review:
- (a) The Departmental Representative shall inspect the Contractor's mechanical work periodically. These inspections are solely for the purpose of determining general quality of work, and not for any other purpose. Inspection and directives given to the Contractor with respect to the mechanical work does not relieve Contractor and his agents, servants and employees of their responsibility to erect and install work in all its parts in a safe and workmanlike manner, and in accordance with the approved drawings and specifications, nor impose upon the Departmental Representative any responsibility to supervise or oversee erection or installation of any work.

**5.4.16. Testing, Adjusting and Balancing (TAB):**

- (a) TAB means to test, adjust and balance systems to perform in accordance with design and commissioning requirements.
- (b) TAB to be performed by a balancing company which is a registered member of AABC, and the final TAB report shall bear the seal and certification number confirming AABC registration.
- (c) Test to verify proper and safe operation, determine actual point of performance, evaluate qualitative and quantitative performance of equipment, systems and controls.
- (d) Adjust and regulate equipment and systems so as to meet specified performance requirements.
- (e) Balance air and hydronic systems and equipment to regulate flow rates to match design conditions. Measure sound/noise levels in each room and include results in TAB report.
- (f) Schedule the time required for TAB (including repairs, re-testing) into the project construction and completion schedule to ensure completion before acceptance of project.
- (g) Specify the sequence of operation of all systems within the Building Automation System specification.
- (h) Review final design drawings before commencement of construction and confirm the adequacy of provisions for TAB, including all aspects of design and installation pertinent to the success of TAB.
- (i) During construction, coordinate the location and installation of all TAB devices, equipment, accessories, measurement ports and fittings.
  - (A) Tab Report:
    - (B) TAB report to show all results in SI units and to include:
      - (i) Project record drawings.
      - (ii) System schematics.
    - (C) Submit one draft copy (hard copy & electronic copy) of TAB Report to the Departmental Representative for verification and approval, in English, in D-ring binders, complete with index tabs.
    - (D) Safety Device Testing:
      - (i) Make complete inspection of all safety devices to ensure:
        - (1) That safety devices are complete in accordance with specifications and manufacturer's recommendations.
        - (2) That the safety devices are connected and operating according to all local regulations.
    - (E) Incorporate review comments and submit 3 copies of final report.

**5.4.17. Project Close-out Documentation & Training:**

- (a) Provide mechanical operation and maintenance data and incorporate into both hard copy and digital searchable CD Operation & Maintenance manuals.
- (b) Provide separately bound Mechanical As-built drawings and As-built specifications manual. As-built drawings and documents shall be provided in the format and media stipulated in the General Requirements Performance Specification.

- (c) Mechanical Operation and Maintenance manuals to be approved by, and final copies deposited with, the Departmental Representative before final inspection.
- (d) Operational data to include:
  - (1) Control schematics for each system.
  - (2) Description of each system and its controls.
  - (3) Description of operation of each system at various loads together with reset schedules and seasonal variances.
  - (4) Operation instruction for each system and each component.
  - (5) Description of actions to be taken in event of equipment failure.
- (e) Maintenance data shall 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.
  - (3) Data shall also include a project specific equipment data-base containing equipment model numbers, serial numbers and parts listings of suggested maintenance spares.
- (f) Performance data to include:
  - (1) Equipment manufacturer's performance data sheets with point of operation as left after commissioning is complete.
  - (2) Equipment performance & commissioning verification test results.
  - (3) Special performance data as specified elsewhere.
  - (4) Final TAB report.
- (g) Approvals:
  - (1) Submit (1) hard copy and electronic copy of draft Operation and Maintenance Manual to the Departmental Representative for approval. Submission of individual data will not be accepted unless directed by Departmental Representative.
  - (2) Resubmit final copies in 3 ring binder with indexed tabs, table of contents, and contact personnel for repair and maintenance. Two (2) hardcopies and five (5) electronic copies shall be provided. Make changes as required by the Departmental Representative.

**5.4.18.** Electric Motors, Motor Drives and Wiring:

- (a) Provide electric motors for all equipment supplied in this Division. Motors to operate at 1800 rpm, unless noted otherwise. Motor design shall comply with Canadian Electrical Code requirements, shall be inverter duty rated complete with minimum class F insulation, capable of handling 1600 V spikes, and include bearing protection grounding brushes. All electric motors supplied shall be capable of being serviced locally.
- (b) All three phase motors shall have a service factor of 1.15 times nominal rated horsepower of the motor.
- (c) Motors 0.75 kw (1 hp) and larger shall be high efficiency motors as defined and tested to CSA C390 or IEEE 112B Standards. Motors 0.37 kw (0.5 hp) and over to be 575 V/3/60 Hz unless specified otherwise. Motors under 0.37 kw to be 120V/1/60 Hz.

**5.4.19.** Preparation for Fire-stopping:

- (a) Provide fire-stopping material and installation within annular space between pipes, ducts, insulation and adjacent fire separation; designs to be ULC approved assemblies for the separation rating required.
- (b) Un-insulated unheated pipes not subject to movement; no special preparation.
- (c) Un-insulated heated pipes subject to movement; wrap with non-combustible smooth material to permit pipe to move without damaging fire-stopping material.
- (d) Insulated pipes and ducts: ensure integrity of insulation and vapour barrier at fire separation.

**5.4.20.** Equipment Installation:

- (a) Unions or flanges: provide for ease of maintenance and disassembly.
- (b) Space for servicing, disassembly and removal of equipment and components: provide as recommended by the manufacturer or as indicated.
- (c) Equipment drains: pipe to funnel floor drains, minimum drain size 20 mm complete with tees and cleanouts for easy cleaning.

**5.4.21.** Anchor Bolts and Templates:

- (a) Provide anchor bolts and templates for installation by other sub-trades.

**5.4.22.** Belt Drives:

- (a) Fit reinforced belts in sheave matched to drive. Multiple belts to be matched sets.
- (b) Use cast iron or steel sheaves secured to shafts with removable keys unless otherwise specified.
- (c) For motors under 10 hp: standard adjustable pitch drive sheaves, having plus or minus 10% range. Use mid-position of range for specified rpm.
- (d) Minimum drive rating: 1.5 times nameplate rating on motor. Keep overhung loads within manufacturer's design requirements on prime mover shafts.
- (e) Motor slide rail adjustment plates to allow for centre line adjustment.

**5.4.23.** Guards:

- (a) Provide guards for unprotected drives.
- (b) Guards for belt drives:
  - (1) Expanded metal screen welded to steel frame.
  - (2) Minimum 1.2 mm thick sheet metal tops and bottoms.
  - (3) 38 mm diameter holes on shaft centres for insertion of tachometer.
  - (4) Install belt guards to allow movement of motors for adjusting belt tension.
  - (5) Guard for flexible coupling:
    - (A) "U" shaped, minimum 1.6 mm thick galvanized mild steel.
    - (B) Securely fasten in place.
    - (C) Removable for servicing.
- (c) Unprotected fan inlets or outlets:
  - (1) Wire or expanded metal screen, galvanized, 19 mm mesh.
  - (2) Net free area of guard: not less than 80% of fan openings.
  - (3) Securely fasten in place.
  - (4) Removable for servicing.

**5.4.24.** Equipment Supports:

- (a) Equipment supports typically supplied by equipment manufacturer.
- (b) Equipment supports not supplied by equipment manufacturer: fabricate from structural grade steel.
- (c) Mount equipment on chamfered edge housekeeping pads, minimum of 100 mm high and 50 mm larger than equipment dimensions all around.

**5.4.25.** Sleeves:

- (a) Pipe sleeves: at points where pipes pass through masonry, concrete or fire rated assemblies and as indicated.
- (b) Schedule 40 steel pipe, galvanized.
- (c) Sleeves with annular fin continuously welded at midpoint:
  - (1) Through foundation walls.
  - (2) Where sleeve extends above finished floor.
- (d) Sizes: minimum 6 mm clearance all around, between sleeve and un-insulated pipe or between sleeve and insulation.
- (e) Terminate sleeves flush with surface of concrete and masonry walls, concrete floors on grade and 25 mm above other floors.
- (f) Fill voids around pipes:
  - (1) Caulk between sleeve and pipe in foundation walls and below grade floors with waterproof fire retardant non-hardening mastic.
  - (2) Where sleeves pass through walls or floors, provide space for fire-stopping. Where pipes/ducts pass through fire rated walls, floors and partitions, maintain fire rating integrity.
  - (3) Ensure no contact between copper tube or pipe and ferrous sleeve.
  - (4) Fill future-use sleeves with lime plaster or other easily removable filler.
  - (5) Coat exposed exterior surfaces of ferrous sleeves with heavy application of zinc rich paint to CGSB 1.181-99.

**5.4.26.** Escutcheons:

- (a) On pipes passing through walls, partitions, floors and ceilings in finished areas: Chrome or nickel-plated brass or Type 302 stainless steel, one-piece type with set screws. Outside diameter to cover opening or sleeve, inside diameter to fit around finished pipe.

**5.4.27.** Access Doors:

- (a) Supply access doors to concealed mechanical equipment for operating, inspecting, adjusting and servicing.
- (b) Flush mounted 600 x 600 mm for hand entry unless otherwise noted. Doors to open 180 degrees, have rounded safety corners, concealed hinges, screwdriver latches and anchor straps.
- (c) Finish Materials:
  - (1) Special areas such as tiled and/or granite surfaces: use stainless steel with brushed satin finish.
  - (2) Remaining areas: match adjacent area.
- (d) Installation:
  - (1) Locate so that concealed items are accessible.

- (2) Locate so that hand or body entry (as applicable) is achieved.

**5.4.28.** Temporary Use of Equipment:

- (a) Permanent systems and/or equipment not to be used during construction period without the Departmental Representative's written permission.
- (b) Equipment used during construction period to be thoroughly cleaned and overhauled. Replace work or damaged parts so equipment is in perfect condition, to entire satisfaction of the Departmental Representative. If in the opinion of the Departmental Representative, sufficient care and maintenance is not being given to equipment and systems, the Departmental Representative reserves the right to forbid further use of said equipment and systems.
- (c) Temporary use of equipment shall in no way relieve Contractor of providing twelve month warranty period to commence as of date of final acceptance of building by Departmental Representative.
- (d) All air filters and pipe strainers are to be replaced prior to turning systems over to the Departmental Representative.

**5.4.29.** Painting:

- (a) Apply at least one coat of corrosion resistant zinc enriched primer paint to ferrous supports and site fabricated work.
- (b) Prime and touch up marred finished paintwork to match original.
- (c) Restore to new condition, finishes which have been damaged too extensively to be merely primed and touched up.

**5.4.30.** Vibration Isolation Seismic Control Measures:

- (a) Provide vibration and isolation devices such as elastomeric pads/mounts, spring mounts and hangers as required to control equipment generated vibration.
- (b) Provide seismic control measures to mechanical equipment to meet the requirements of the NBC latest version. Provide full report and drawings stamped and signed by Professional Engineer with seismic design and calculations to support equipment seismic design.

**5.4.31.** Security Grilles:

- (a) Ductwork with a cross-sectional area greater than 620 square centimetres (96 square inches) and crossing a secure zone shall require additional security measures.

**5.4.32.** Spares:

- (a) Replacement parts and spares for equipment designed and installed shall be available locally, and on site within 24 hours of being requested/ordered. Provide an inventory of spare and replacement parts for one (1) year of operation.

**5.5. THERMAL INSULATION**

**5.5.1.** General:

- (a) Thermal insulation shall be provided for all mechanical systems including domestic water, hydronic heating and cooling piping, and ductwork. Design basis for thermal performance/thicknesses ASHRAE 90.1.

**5.5.2. Pipe Insulation:**

- (a) Components of insulation system to have maximum flame spread rating of 25 and maximum smoke developed rating of 50 in accordance with CAN 4-S102.
- (b) Applications: Domestic hot, cold and recirculation piping; Hydronic heating and cooling piping.
- (c) Materials:
  - (1) Rigid, one-piece fibreglass pipe insulation with all service jacket of high density white kraft bonded to aluminum foil. Integral foil vapour retarder on systems susceptible to condensation (chilled water, domestic cold water piping). Refrigerant piping shall be covered with elastomeric insulation.
  - (2) Jackets: inside exposed locations PVC, outside Aluminum alloy or stainless steel.

**5.5.3. Duct Insulation:**

- (a) Components of insulation system to have maximum flame spread rating of 25 and maximum smoke developed rating of 50 in accordance with CAN 4-S102.
- (b) Materials: Rigid mineral fiber board to TIAC Code C-1, and Mineral fiber blanket to TIAC Code C-2 Jackets: Inside canvas with compatible lagging adhesive, outside aluminum 0.50mm thick
- (c) Applications:
  - (1) Supply air ductwork, 25 mm thick min.
  - (2) Outdoor air intake ductwork, 50 mm thick min.
  - (3) Exhaust air ductwork. 1.5 m inside from louver, 50 mm thick min.
  - (4) Insulation needs to comply with ASHRAE 90.1.

**5.5.4. Equipment insulation: Apply where required. Materials to be suitable for the application.**

**5.6. PLUMBING & MISCELLANEOUS PIPING SYSTEMS**

**5.6.1. General Requirements:**

- (a) All plumbing will be to current National and Provincial Plumbing Code.
- (b) All fixtures will be designed for low water usage.
- (c) Backflow Prevention devices shall be provided in accordance with good design practice and requirements of the Province of British Columbia.
- (d) Floor drains shall be provided in washrooms, detention cells, janitor's rooms and mechanical rooms. All floor drains to have an automatic trap seal primer. Provide funnel floor drains in mechanical rooms. All floors sloped to drain.
- (e) The proposed domestic water heating fuel will be fuel oil. Domestic water heating plant shall be located in the mechanical room.

**5.6.2. Area Specific Requirements:**

- (a) Detention cells shall have a stainless steel penal type lavatory/water closet combination unit.
- (b) Provide a stainless steel tray (type 316, gauge 14) approximately 610mm x 450mm x 100mm deep and cold water hose bibb for boot washing , location to be provided. Emergency eyewash station is required in the Secure Corridor serving the Detention Cells, location to be provided.

- (c) A full emergency shower and eye wash station is to be located in the Inspection Bays, location to be provided.
- (d) A hose bibb is required in the Secure Corridors serving the Detention Rooms, location to be provided.

**5.6.3. Materials: Plumbing**

- (a) The following products listing is not intended to be an exhaustive comprehensive list/specification of the plumbing and miscellaneous piping components required by this Section; the list represents minimum standards that the Contractor shall satisfy and/or exceed and supplement to achieve a complete functional system(s).
  - (1) Piping: Domestic Water: The domestic hot and cold water systems, within the building shall be copper tube, hard drawn, type L: to ASTM B88M, for above ground applications. Cast copper fittings shall be solder type in accordance to ANSI B16.18. Wrought copper and copper alloy fittings shall be copper type in accordance to ANSI/ASME B16.22.
  - (2) Joints: Solder shall be lead-free. Teflon tape shall be applied for threaded joints. Dielectric connections between dissimilar metals shall have dielectric flanges or unions complete with thermoplastic gasket or washer.
  - (3) Valves:
    - (A) Gate Valves: For NPS 2 and under: soldered gate valves complete with rising stem shall be in accordance to MSS SP-80, Class 125, 860 kPa, bronze body, screwed bonnet, solid wedge disc. For NPS 2 and under: screwed gate valves complete with rising stem shall be in accordance to MSS SP-80, Class 125, 860 kPa, bronze body, screwed bonnet, solid wedge disc.
    - (B) Globe Valves: For NPS 2 and under: soldered globe valves complete with rising stem in accordance to MSS SP-80, Class 125, 860 kPa, bronze body, screwed bonnet, renewable composition disc. Lockshield handles shall be used where applicable. For NPS 2 and under: screwed globe valves complete with rising stem in accordance to MSS SP-80, Class 150, 1 MPa, bronze body, screwed bonnet, renewable composition disc. Lockshield handles shall be used where applicable.
    - (C) Swing Check Valves: For NPS 2 and under: soldered swing check valves shall be in accordance to MSS SP-80, Class 125, 860 kPa, bronze body, bronze swing disc, screw-in cap, regrindable seat. For NPS 2 and under: screwed swing check valves in accordance to MSS SP-80, Class 125, 860 kPa, bronze body, bronze swing disc, screw-in cap, regrindable seat.
    - (D) Ball Valves: For NPS 2 and under: soldered ball valves shall be 600 pound, bronze body, chrome plated brass ball, Teflon seat, steel lever handle, with soldered connections. For NPS 2 and under: screwed ball valves shall be 600 pound, bronze body, chrome plated brass ball, Teflon seat, steel lever handle.
  - (4) Piping and Fittings: Copper DWV
    - (A) Above ground sanitary (including condensate drains), storm and vent, type DWV in accordance to ASTM B306. Cast brass fittings in accordance to CAN/CSA B125.3. Wrought copper fittings in

accordance to CAN/CSA B125.3. Solder fittings shall be lead free in accordance to ASTM B32.

- (5) Cast Iron Piping and Fittings:
  - (A) Above ground sanitary, storm and vent in accordance to CAN/CSA-B70. Mechanical joints shall be neoprene or butyl rubber compression gaskets with stainless steel clamps.
- (6) PVC Piping and Fittings:
  - (A) For buried service, ABS or PVC, DWV pipe and fittings shall be in accordance to CAN/CSA-B181.1 and B181.2. Solvent weld joints shall be in accordance with ASTM D2564.
- (7) Plumbing Fixtures and Trim, Plumbing Specialties:
  - (A) Fixtures shall be manufactured in accordance with CAN/CSA-B45 series. Trim and fittings shall be manufactured in accordance with CAN/CSA-B125.3. Exposed plumbing brass to be chrome plated. Fixtures to be the product of one manufacturer and of the same type. Trim in any location to be the product of one manufacturer and of the same type. Reference CAN/CSA-B651 Barrier Free Design
  - (B) Backflow Prevention:
    - (i) Preventers: to CSA-B64 Series, supply as applicable as reduced pressure principle type, double check valve assembly, or back flow preventer with intermediate atmospheric vent or vacuum breaker. All to be supplied with full port resilient-seated ball or gate valves complete with four ball valve test cocks, bronze construction, 1200 kPa rated.
  - (C) Floor Drains:
    - (i) Dura-coated cast iron body and clamp collar, polished nickel bronze strainer head with grate c/w trap primer connection. In Detention Cells grates will be secured with tamper proof screws.
  - (D) Drinking Fountains:
    - (i) Wall mounted, barrier free water cooler, stainless steel cabinet and top bubbler, valve stream regulator, pre-cooler, temperature control, 120V, single phase connection. CFC free.
  - (E) Funnel Drain:
    - (i) Dura-coated cast-iron body, clamp collar, polished nickel bronze strainer with one-piece oval funnel.
  - (F) Water Hammer Arrestors:
    - (i) All stainless steel construction with internal bellows and 19 mm NPT connection.
  - (G) Urinals:
    - (i) Vitreous china, washout wall hung urinal with flushing rim, top spud, integral trap, stainless steel strainer, 19mm top spud, steel supporting hangers, infrared, on-demand, proximity activated operation (connected to transformer), flush valve. Colour white.

- (H)** Stainless Steel Sink:

  - (i)** Double or single bowl as required, 1.0 mm thick 302 Stainless Steel, ledge-back, self-rimming, undercoated, clamps, basket strainer, bright mirror finished rim and satin finished bowls.
  - (ii)** Trim: single handle deck faucet with polished chrome plated finish, chrome plated stainless steel cover plate, 200 mm tubular swing spout, standard 0.13 L/s flow control aerator, 70 mm lever blade handles. 40 mm copper P-trap with clean-out. Complies with ANSI/ASME Standard A112.18.1M.
- (I)** Lavatories:

  - (i)** Counter-top porcelain on steel, self rimming, with front overflow, semi-oval, supply openings 200mm OC, chrome plated supply and waste fittings, mixing spout, washerless pop up waste, aerator, metal blade handles. Colour white
- (J)** Lavatories – Physically Handicapped:

  - (i)** Wall hung vitreous china, low shelf integral back, contoured front, shallow front basin with front overflow. Wheelchair supply fitting with gooseneck spout, 150mm blade handles, offset tailpiece. Colour white.
- (K)** Janitor’s Room Sinks:

  - (i)** Terrazzo mop service basin, 900 x 600 mm, 250 mm high walls, stainless steel backsplash panels, stainless steel mop hangers, combination dome strainer and stainless steel lint basket, with built-in elevated vacuum breaker, indexed cross handles, 1400 mm long rubber hose, escutcheons, union inlets, heavy cast brass spout with pail hook, aerator, brace to wall, integral stop valves, hose thread outlet.
- (L)** Water Closets – Standard:

  - (i)** Vitreous china, wall mounted, siphon jet, elongated rim, proximity sensor activated, low-flow flush valve, moulded solid plastic open front seat without cover, stainless steel hinges and solid brass post inserts. Colour white.
- (M)** Water Closets – Physically Handicapped:

  - (i)** Vitreous china, wall mounted, 455mm high, siphon jet, elongated rim, proximity sensor activated, low-flow flush valve, moulded solid plastic open front seat without cover, stainless steel hinges and solid brass post inserts. Colour white.
- (N)** Combination Lavatory/Toilet:

  - (i)** For use in the Detention Cells, 1.6 mm thick type 304 stainless steel, angled, elongated bowl, 450 mm high, with a self draining rim and integral contoured seat, 6 liters per flush, trapway to pass 54 mm diameter ball. Lavatory bowl with hot & cold water valve, bubbler, and fast drain outlet, recessed toilet tissue holder, security metering valve,

- check stops, wall sleeve, and concealed flush valve.  
Provide lockable wall access panel
- (ii)** Acceptable Product:
    - (1)** Acorn 1440 - 18" Ligature Resistant Toilet-Lavatory Comby
  - (O)** Hose Bibs:
    - (i)** Interior: 20 mm hose connection, bronze body, polished chrome, hot and cold water index buttons, 5-rib handle, vacuum breaker.
  - (P)** Non-Freeze Wall Hydrant:
    - (i)** Outdoor, non-freeze, recessed wall hydrant, complete with bronze head and valve, renewable bronze seat and integral vacuum breaker, NPS 3/4" hose outlet, removable operating key (minimum of three (3)). Polished nickel bronze box with hinged access cover.
  - (Q)** Roof Drains:
    - (i)** Epoxy coated cast iron body, with cast iron dome, under-deck clamp to suit roof construction, flashing clamp ring with integral gravel stop, size 300 mm.
    - (ii)** Provide minimum two roof drains to each building. Connect roof drains to First Flush Diverters located in mechanical room and/or at the corner of the Primary Inspection Lane. Calculate size of First Flush Diverter based on size of drainage area. Install shutoff valve/bypass to First Flush Diverters. Provide emergency roof scuppers at all roof drain locations. Scuppers shall be made of prefinished metal with colour matching exterior siding.
      - (1)** Acceptable Product:
        - (A)** First Flush Diverter:
        - (B)** Rain Harvesting Pty First Flush Diverter for Post or Wall Mounting WDPW99 – Painted to match adjacent finishes
  - (R)** Clean Outs:
    - (i)** Epoxy coated cast iron body with integral anchor flange, adjustable combined access cover and plug with gasket seal. Finished areas with round nickel bronze finish cover and plug, unfinished areas with ductile iron cover and plug.
  - (S)** Trap Primers:
    - (i)** Automatic trap primer, all bronze body with integral vacuum breaker, non liming internal assembly with gasketed bronze cover.
  - (T)** Expansion Tank
    - (i)** Refer to Specification Section 44 41 13.01.
  - (U)** Shower:
    - (i)** Pressure balancing mixing valve with integral service stops and adjustable stop screws to limit handle turn. Shower head with arm and flange.

- (V)** Domestic Water Heaters:
  - (i)** High efficiency, oil fired water heater, glass lined inner tank with anode, draft regulator, blocked flue safety switch, ent, electronic controls, adjustable aquastats, and pressure and temperature relief valve. Provide drains as required by code and local authorities.
- (W)** Emergency Eyewash or Eyewash and Shower:
  - (i)** Combination shower and eye/face wash to ANSI Z 358.1, chrome plated brass, identification sign and inspection tag.
  - (ii)** Unit to include a stainless steel 11" (27.9 cm) round bowl, an eye/face wash head featuring inverted directional laminar flow, achieving zero vertical velocity, supplied by an integral flow control.
  - (iii)** Unit shall include hydrodynamic designed stainless steel drench showerhead with integral 20 gpm (75.7 L) flow, flow control, chrome-plated brass stay-open ball valve equipped with stainless steel ball and stem, and chrome-plated brass in-line 50 x 50 mesh water strainer.
  - (iv)** Unit shall include Schedule 40 hot-dipped galvanized steel pipe and fittings, powder-coated cast-iron 9" (22.9 cm) diameter floor flange, self-adhesive high visibility safety green and bright yellow stripes, universal sign, and 1-1/4" IPS supply.

## 5.7. FIRE PROTECTION

- 5.7.1.** Portable Fire Extinguishers complying with NFPA 10, type ABC, rechargeable canister type, 4.2 kg capacity, mounted in recessed wall cabinet, chrome finish, clear front, mounting hardware and signage.

## 5.8. HEATING, VENTILATING AND AIR CONDITIONING, HVAC SYSTEMS

- 5.8.1.** HVAC Systems General Requirements:
  - (a)** The HVAC systems shall meet the Federal Halocarbons Regulations and be CFC and HCFC free.
  - (b)** Space Conditions System Performance: the HVAC systems shall be designed and implemented to meet or exceed comfort conditions for acceptable Indoor Air Quality as specified in ASHRAE Standard 62.1. The HVAC systems shall be designed to comply with NECB (2011) or ASHRAE 90.1 (2010), whichever is more stringent. Specifically the system(s) shall satisfy space set-points for temperature and humidity within the following parameters, unless noted otherwise.
    - (1)** Summer Temperature      Range: 20 – 26 °C, adjustable setpoint, space temperature to within +- 1 °C of setpoint
    - (2)** Summer Humidity:          50 % RH, +- 10% of space humidity
    - (3)** Winter Temperature        Range: 20 – 26 °C, adjustable setpoint, space temperature to within +- 1 °C of setpoint
    - (4)** Winter Humidity:            above 30 % RH of space humidity
    - (5)** Special dehumidification beyond the one resulting from cooling to maintain cooling setpoint is not required for this project.

- (6) Individual Zone Temperature Range to be accommodated  $\pm 2$  °C. Individual zone temperature range refers to the temperature range in a particular zone over which an individual occupant can adjust his/her space conditions.
  - (7) Refer to General Mechanical Requirements for operating noise levels. Mechanical rooms shall be acoustically insulated as a system in order to comply with ASHRAE standards. Treatment of noise and vibration at source is the preferred method of reducing noise.
- (c) Energy Use System Performance the Contractor shall employ proven and innovative energy conservation techniques in systems designs to ensure the operating energy budget shall be in accordance with NECB / ASHRAE 90.1. Systems Descriptions:
- (1) The benchmark HVAC system shall be two (2) oil fired, high efficiency, up-flow furnaces (one (1) standby for heating only), the primary unit being supplied with an auxiliary refrigerant cooling coil, both located in the Mechanical Room, providing heating, cooling and ventilation through a duct distribution system). Heat recovery ventilators shall be utilised to capture heat from the exhaust air streams. Forced flow heaters shall serve entrance vestibules. LAN/ Telecom Rooms will be separately served by standalone cooling and pressurisation air systems, to maintain a temperature between 20 and 25 °C, delivering filtered air (Merv 10 minimum),
    - (A) Incorporate high efficiency active solar thermal energy systems such as vacuum tube collector where possible.
  - (2) The forced-flow furnaces shall be of modular and durable construction, incorporating a heavy gauge steel heat exchanger, high efficiency burner, heavy-duty fuel pump, insulated blower compartment, and durable insulated steel cabinet, one (1) of the units being supplied with an insulated, cased evaporator cooling coil matched to an outdoor condensing unit. The outdoor condensing unit shall incorporate heavy gauge, galvanized steel, high efficiency copper coils with aluminum fins, reliable and efficient compressor, balanced axial fan, with low ambient capability, and protection covers for winter.
  - (3) During occupied periods heat recovery will be used to increase the fresh air to the buildings and to keep energy use at a minimum. The heat recovery section, when not utilised in the heat recovery mode, will be used as the main building exhaust. The core of the heat recovery section will be certified to ARI 1060.
  - (4) Supply and return air ductwork shall be insulated galvanized steel. Ductwork shall maintain the integrity of all fire separations as required by code. Supply diffusers/ registers shall be of a type suitable for the air distribution required and to maintain environmental conditions in accordance with ASHRAE 55. The building shall be slightly positive with respect to the outdoors. Mechanical & Electrical Rooms: the various mechanical and electrical rooms shall be provided with heating systems capable of maintaining a minimum space temperature of 17 °C.
  - (5) General Exhaust: a centralized duct distribution system, connected to the heat recovery recovery ventilator shall satisfy exhaust requirements of all Washrooms (WC's), Janitor Rooms, photo copier areas, , Detention Cells and Secure Corridors. Washroom exhaust airflow rates shall conform to Canada Labour Code.

- (6) Supply air shall be filtered with appropriate preliminary and final filters. The minimum final filtration level shall be MERV 11. Insulation systems shall provide complete coverage of all system components. Supply and return air duct mains shall be routed through main corridors. Corridors shall be provided with ventilation/cooling through ceiling diffusers.
- (7) Outside supply and exhaust air streams to/from the forced flow heaters and heat recovery ventilator shall be through weather proof architectural louvers. Louvers shall be located to avoid entrainment of outside air contaminants. Pay particular attention to vehicular traffic flow to avoid such entrainment.

**5.8.2. Heating Plant**

- (a) The proposed heating source for this facility will be fuel oil which will be burned in a benchmark high efficiency, indirect fired, heat exchanger section of the forced flow furnaces. Size the fuel oil storage tank capacity to allow for a minimum of three (3) months continuous use during the months of December, January and February.
- (b) Design and installation to be registered with the relevant Provincial Safety Authority.

**5.8.3. Special Requirements:**

- (a) Security type grilles will be used in all the Search Rooms and Detention Cells.
- (b) The secure areas will be kept at a negative pressure with respect to the adjacent spaces and no air will be returned to the forced flow furnaces from these areas.
- (c) Maintain the STC rating of identified walls by using cross talk silencers and acoustically insulated walls.
- (d) Maintain the security rating of identified walls using expanded metal panels. Utilise sleeves for ductwork and other services penetrating these walls and protect duct openings with security bars as detailed.
- (e) A separate temperature controlled ventilation system is required for the LAN room.
- (f) The area of the mechanical rooms shall be large enough to allow space for servicing and removal of equipment components. As an example where equipment is near the walls or near other equipment, the space around shall be sufficient to allow for servicing, repairing, removing and/or maintaining equipment or replacing parts.
- (g) Locate incoming air and exhaust air louvers at a distance far enough apart to avoid cross contamination.
- (h) Provide enough space around controlled equipment, valves, motors, etc. to allow for servicing.
- (i) Provide forced flow heaters in entrance vestibules.
- (j) Provide one Energy Star stainless steel range hood minimum 24" wide, with minimum 180 cfm, variable speed and maximum 7.0 sones at staff kitchenette.

**5.8.4. Materials:**

- (a) The following product listing is not intended to be an exhaustive comprehensive list/specification of the HVAC systems; the list represents minimum standards that the Contractor shall satisfy and/or exceed and supplement to achieve a complete functional system(s) consistent with all applicable code requirements.

As part of the final design processes the Contractor shall meet with the Departmental Representative and his operating staff to review preferred material/equipment types, system arrangements, maintenance preferences, etc.

- (1) Piping:
  - (A) Fuel-oil piping, steel to ASTM A53/A53M, Schedule 40, continuous weld or screwed. Screwed fittings to be prepared with Teflon tape or pulverized lead paste.
- (2) Valves:
  - (A) Ball Valves: NPS 2 and under, bronze body, screwed ends, TFE seal, hard chrome all, 4 MPa, WOG.
  - (B) Lubricated Plug Valves: NPS 2 and under, to ASTM B61, Class 150, 1MPa, bronze body.
  - (C) Globe Valves: NPS 2 and under, screwed, to MSS-SP-80, Class 125, 860 kPa, bronze body, screwed bonnet, renewable bronze disc.

**6.0 ENERGY MANAGEMENT & CONTROL SYSTEM (EMCS)**

**6.1. GENERAL REQUIREMENTS**

- 6.1.1.** Provide an EMCS system to control and monitor the performance of the HVAC systems onsite and allow remote access to ensure proper sequence of operation under all operating conditions (occupied, unoccupied, emergency, loss of power, fire, disaster, smoke, weather, etc.). The control system shall be connected to an uninterruptable power supply (UPS). Integrate the design of the EMCS to include various building systems such as mechanical, electrical, fire and section 21.1.8
  
- 6.1.2.** Provide for training of operating personnel and full commissioning of the EMCS system

## **7.0 ELECTRICAL PERFORMANCE SPECIFICATIONS**

### **7.1. REFERENCE CODES, STANDARDS AND GUIDELINES**

- 7.1.1.** The electrical systems for this facility shall be designed by a licensed Professional Engineer practicing in British Columbia in conformance with all federal, provincial and municipal laws and regulations and shall conform to the current edition including revisions of the codes and standards of the following technical associations and organizations:
- (a)** CSA – Canadian Standards Association
  - (b)** NBC – National Building Code
  - (c)** NFC – National Fire Code
  - (d)** NFPA – National Fire Protection Association
  - (e)** ULC – Underwriter's Laboratory of Canada
  - (f)** Specific requirements listed in this document may exceed the minimum requirements stated in the codes, standards, etc. of the above organizations. The Contractor is advised that in all cases the most restrictive requirements shall apply.
  - (g)** CSA-Z462- Arc Flash Std.
  - (h)** CSA 282 – Emergency Electrical Power Supply for Buildings
  - (i)** CSA B44 – Safety Code for Elevators and Escalators
  - (j)** CEC – Canadian Electrical Code
  - (k)** ANSI/TIA Communications standards and BICSI TDM Manual

### **7.2. REFERENCE DRAWINGS AND DOCUMENTS**

- 7.2.1.** Design shall be based on the information contained in this specification, data sheets and architectural schematic layouts/diagrams. Design shall also be coordinated with the requirements of all other disciplines.
- 7.2.2.** Minimum power, lighting and communications devices and fixtures are indicated on Room Data Sheets. Locations shall be coordinated during the design phase.
- 7.2.3.** Upon request by the Departmental Representative, the Contractor shall submit a copy of design calculations to satisfy the Departmental Representative that specific design criteria and requirements are being met.

### **7.3. GENERAL ELECTRICAL REQUIREMENTS**

- 7.3.1.** General
- (a)** The Contractor shall include all design, documentation, labour, materials and equipment required for installing, testing and commissioning of electrical systems as detailed in all sub-sections of this Electrical Performance Specification.
  - (b)** The Contractor is advised that the orientation and requirements of the proposed electrical systems described in this performance specification represents the preferences of the Departmental Representative. The Contractor without limiting his/her ingenuity or utilization of his/her experience and abilities shall incorporate as a minimum the intent of these preferences into the electrical systems designs.

- (c) Existing Conditions: Investigate site and local conditions affecting work under this specification. Coordinate with Structural, Architectural, and Mechanical to ensure work can be performed in a seamless manner without changes to the PWGSC supplied Conceptual Drawings.
- (d) Obtain Departmental Representative approval before commissioning systems and putting into service. System commissioning shall be performed in the presence of the Departmental Representative.
- (e) Permits and Regulations: Obtain all regulatory permits and pay all fees for performing the work based on the approved final engineering drawings.
- (f) Review approved drawings with Departmental Representative, and authorities having jurisdiction to ensure compliance with all applicable codes and bylaws. Supply upon request design calculations to Departmental Representative to verify that project requirements will be satisfied.
- (g) Execution of Design: refer to Technical Requirements within this SPECIFICATION for requirements relating to the execution of design.
- (h) Contractor shall coordinate with the Power Supply Utility and Local Exchange Carrier for connection and disconnection of electrical and Communication services to the new facility.

**7.3.2.** Execution of Work:

- (a) Install work in advance of concrete pouring or similar work. Provide and set sleeves as required.
- (b) Install concealed wiring and equipment neatly, close to building structure so furring is minimum size. Equipment installed improperly, to be removed and replaced without cost to Departmental Representative.
- (c) Protect and maintain work until building has been completed and accepted. Protect work against damage during installation. Cover with tarpaulins if necessary. Repair all damage to floor and wall surfaces resulting from carrying out work, without expense to and to the satisfaction of the Departmental Representative.
- (d) Coordinate work with other sections to avoid conflict and to ensure proper installation of all equipment. Review all applicable drawings.
- (e) On completion of work, remove tools, surplus and waste material and leave work in clean and new condition.

**7.3.3.** Voltage Utilization

- (a) Electrical voltages shall be 120/240 V, single phase, 3 wire.
  - (1) Motors 0.5HP and larger to be single phase. Motors less than 0.5HP to be 120V or 240V, single phase. Motors larger than 1HP to be 240V.
  - (2) Interior and building exterior lighting to be 120V, single phase.
  - (3) Site lighting to be 120V, single phase.

**7.3.4.** Voltage Drop

- (a) The allowable voltage drop from the source of supply to the point of utilization shall be no more than 5%. In general, this shall be apportioned as follows: 2% for feeder mains to distribution panels and 3% for branch circuits.
- (b) In sizing branch circuits for receptacles the full allowable load of 80% shall be assumed to occur at the most remote receptacle.

**7.3.5. Sprinkler Proofing**

- (a) Regardless of whether or not the building is sprinkled, major pieces of exposed electrical equipment shall still be protected by supplying drip shields. All water piping shall be installed away from these critical areas in case of potential leakage. Penetrations through drip shields shall be avoided. Should penetrations be required, the appropriate measures to avoid water penetration shall be used.

**7.3.6. Electrical Motors**

- (a) All motors supplied shall be high efficiency whether they come with packaged equipment or supplied independently.
- (b) Where motors are controlled through a VFD they shall be inverter duty, matched to the drive. All VFDs shall have a bypass and all motors larger than 1.5HP shall not have across the line starting for a bypass.

**7.3.7. Electrical Hazardous Areas**

- (a) There are no activities or operations planned for the building, which require explosion proof wiring or equipment. Should this change, all such areas shall utilize appropriate fixtures, devices and protection and be installed in accordance with the Canadian Electrical Code.

**7.3.8. Laws, Rules, Ordinances, Permits and Certifications**

- (a) Comply with requirements of the Electrical Supply Authority, the latest edition of the Canadian Electrical Code, with all Provincial and Municipal Laws, Rules and Ordinances, and to the satisfaction of those persons having jurisdiction over same.
- (b) Prepare and submit to the proper authorities all required drawings and obtain all necessary permits and pay all fees connected therewith.
- (c) Be responsible for arranging, and pay all required fees, for inspection of the work by authorities having jurisdiction over same.
- (d) Furnish certificates necessary as evidence that work installed conforms to the regulations of authorities having jurisdiction.

**7.3.9. Workmanship and Materials**

- (a) The installation shall consist of material and equipment specified. All equipment supplied under this contract shall be new and best of its respective kind, of uniform pattern throughout and be compatible with new environment in which it is located.

**7.3.10. Warning Signs**

- (a) Provide warning signs, as specified and/or to meet requirements of Inspection Department and Departmental Representative. Remove all temporary signs at the end of job.
- (b) Use decal signs, minimum 175 mm x 250 mm size.

**7.3.11. Identification of Equipment**

- (a) Suitably identify all panels and equipment racks (i.e., power, lighting,) on top of the door to indicate designation, function and characteristics of panel and equipment. Panel directories shall be typewritten lamacoid to indicate equipment and location of equipment controlled by each branch circuit. All directories shall

be securely mounted on the inside of the panel door and shall have a protective transparent cover. All disconnect switches, pull boxes and splitters installed, where identification may only be on the outside, shall have neat, securely fastened nameplates to indicate their function. Motor starters and control devices wired under this contract shall be suitably marked as to purpose with similar nameplates. All labels and nameplates shall be "Lamacoid" plates, securely fastened with screws. Lamacoids shall be black with white face for normal power and red with white face for emergency power.

- (b) All receptacles and power connections shall have a Lamacoid strip on which the panel and breaker number from which it is fed is indicated. The identification shall be secured on the cover plate of the appropriate outlet. The circuit can be noted on the device using indelible pen and at a location covered by the cover plate.
- (c) Adjacent to each breaker in CDP type panel boards, provide and mount Lamacoid nameplates identifying their respective load, voltage and phase, and which panel or equipment is being fed by the respective circuit. Normal powered nameplates shall be black with white lettering, backup powered nameplates shall be red with white lettering. Unless specifically indicated otherwise, lettering size to be as follows:
  - (1) Receptacle and other outlet box coverplates: 5-mm minimum height (0.76-mm inscription width).
  - (2) Others: 7-mm minimum height (1.02-mm inscription width) when less than 2500 mm above floor; 10-mm minimum height (1.52-mm inscription width) when more than 2500 mm above floor.
  - (3) Prior to nameplate fabrication, submit to the Departmental Representative and Departmental Representative for approval a copy of all panel directories and a list stating exact wording and fabrication details for all nameplates.
  - (4) All junction boxes pull boxes wiring boxes etc, which are in concealed locations, shall be identified with clearly legible hand printed permanent black markers.

#### **7.3.12. Access Doors**

- (a) The locating of electrical equipment in concealed locations is discouraged.
- (b) Provide access doors where electrical equipment must be accessible. Access doors to be 12 GA steel, approximately 300 mm x 300 mm or as approved, finished prime coat only, with concealed hinges, anchor straps, plaster lock and without screws. Where it is necessary for persons to enter through door, doors to be at least 450 mm x 600 mm.
- (c) Access doors located in fire rated ceilings shall be approved ULC stamped, fire rated doors.
- (d) Access doors must be lockable. Provide a minimum of three keys per door except where access doors are keyed alike, when three keys in total would be sufficient.

#### **7.3.13. Current Carrying Electrical Components**

- (a) All current carrying components of the electrical installation shall be copper except where noted otherwise. This shall include all branch feeder conductors, bus work, interconnecting components, etc.

- (b) Feeders for large loads (excepting vibrating equipment such as Roof Top Units) and panels and transformer windings shall be Aluminum.

**7.3.14. Firestopping**

- (a) Electrical trades having openings in fire rated assemblies for the passage of conduit, duct, etc., shall be responsible for fire stopping utilizing a CAN/ULC Approved Firestopping system around such openings in order to maintain the integrity of the fire separations.
- (b) All wireways, bus duct or equivalent shall have fire stopping located within a fire separation.
- (c) Exposed wiring and cable trays through fire separations shall use re-penetrable CANULC Approved Firestopping system intended for the purpose.

**7.3.15. Housekeeping Pads**

- (a) All floor mounted electrical equipment shall be mounted on concrete housekeeping pads. Pads to be 100 mm high. Another trade shall paint pads and equipment floor with epoxy paint prior to equipment installation.

**7.3.16. Building Envelope Integrity**

- (a) Avoid penetrating through building envelope air barrier. Where penetrations are necessary, maintain the integrity of the air barrier using suitable materials, methods and trades people approved by building envelope contractor.
- (b) Repair building envelope at all locations where envelope has been penetrated as a result of removal and/or relocation of existing electrical equipment, piping, ductwork, conduit, cable, wiring, etc. in a manner approved by building envelope contractor.

**7.3.17. Surface Mounted Wireways and Power and Communications (Pac) Poles**

- (a) Surface Mounted Wireways and PAC poles are not acceptable for use in this facility. Workstations and equipment are to be fed from adjacent walls or flush/semi-flush floor boxes.

**7.4. REQUIREMENTS FOR ELECTRICAL ENGINEERING**

**7.4.1. General**

- (a) The requirements of this section are in addition to and supplement the requirements specified elsewhere in the Contract Documents.

**7.4.2. Submissions**

- (a) The Contractor shall submit the following engineering submissions, during the design development, in addition to those requested elsewhere.
  - (1) Lighting design calculations for all areas of the building and on the site. These calculations shall include fixture cut sheets showing the photometric, light power density and physical data the design is based on. These will be used to evaluate and review future shop drawing submissions.
  - (2) Emergency lighting design calculations.
  - (3) Load calculation for both normal & Stand-bypower.

### **7.4.3. Drawing Requirements**

- (a)** The construction drawings for submission shall include:
  - (1)** Single Line Diagrams
  - (2)** Fire Alarm Riser Diagrams
  - (3)** Panel Schedules
  - (4)** CCTV Riser Diagrams
  - (5)** Security System Riser Diagrams
  - (6)** Communication Raceway and Riser Diagrams
  - (7)** Plan Drawings at 1:100 scale for power and systems
  - (8)** Plan Drawings at 1:100 scale for lighting and lighting controls
  - (9)** Lighting Fixture Schedules (on the drawings)
  - (10)** Mechanical and Owner's Equipment Schedules Detailed scaled drawings showing equipment arrangements within electrical rooms and communications rooms.
  - (11)** Site Plan showing all the service ducts, duct profiles, lighting, power etc.
  - (12)** CEC Code Load

### **7.4.4. Short Circuit Protection Device Coordination and Arc Flash Analysis**

- (a)** The Contractor shall perform a preliminary Short Circuit Protection Device Coordination and Arc Flash Analysis during the design of the distribution system to ensure major electrical equipment is sized and equipped to be capable of providing selective coordination under all scenarios. A formal Short Circuit Protection Device Coordination and Arc Flash Analysis shall be submitted for review during the construction stage. The study shall include Arc Flash currents calculations for equipment labeling as per CSA Z462. All labelling for Arc Flash by this contract.

## **7.5. MAIN ELECTRICAL SERVICE**

### **7.5.1. General**

- (a)** The service entrance shall be single-phase three wire 120/240 volt. The size needs to be verified and calculated during design but is anticipated to be at minimum 400 amps.

### **7.5.2. Service Size**

- (a)** The Contractor shall confirm the above analysis and ensure a minimum spare capacity of 30% is maintained.

### **7.5.3. Service Entrance Switchgear**

- (a)** The Main Disconnect shall be designed and installed as service entrance rated equipment to the Utility Provider's standards and. This means it shall have a service entrance rated main breaker and a metering section suitable for Utility revenue metering. The metering CT and PT connections shall initially be connected by copper bus links.
- (b)** A digital metering package shall be installed complete with CT's and PT's and provide signals to Building Automation System (or system as directed by Departmental Representative). This is in addition to Utility Provider Metering.

#### **7.5.4. Utility Coordination**

- (a)** Review all requirements for Power and Communications (including temporary services) and coordinate with the respective utilities to ensure service is available when needed.
- (b)** All services on this site shall be located overhead via a power pole connection to a service mast located on the building..
- (c)** For Power, the contractor is responsible to contact Utility Providers, arrange for service to the building, pay all the fees and carry all the works required to help utility company bring the services specified to the building.
- (d)** The contractor to contact Utility Providers to provide service as indicated. Allow for completing the application and coordination of payment to the Utility Provider for bringing the service to the site as well as connection to the building. The contractor must contact the Utility Provider and coordinate all the required works for bringing the service to the site and connection to the building. . These works will be part of the scope of base contract by design build contractor.
- (e)** The connection to the Utility Provider and Local Exchange Carrier is also part of the scope of this contract to make the building fully operational. Coordinate payments with Utility provider and owner.

### **7.6. POWER DISTRIBUTION DESIGN**

#### **7.6.1. General**

- (a)** The power distribution shall consist of 120/240V Central Distribution Panels, located in the electrical rooms. Each electrical room shall be fed from at least one 120/240V breaker located in the Service Entrance Switchgear.
- (b)** Each of the above electrical rooms shall have a 120/240V single phase three wire panel. All panels and other electrical equipment installed in the building to be provided with drip hoods.

#### **7.6.2. Wiring Methods**

- (a)** Main indoor feeders and sub feeders shall be of insulated copper conductors and installed in EMT with steel fittings. Alternative raceway methods shall meet the requirements of the Canadian Electrical code. All underground and in slab conduits shall be PVC Schedule 40 and all the above ground conduits inside the walls and above grade to be EMT with steel fittings.
- (b)** Branch wiring shall be in minimum 21 mm EMT. All conduits shall not exceed 30% of the rated CEC fill capacity.
- (c)** Minimum wire size for 120 volt and above shall be No. 12 gauge.
- (d)** Lighting circuits shall be in EMT. AC 90 (BX) is only permitted for final connections to each light fixture and shall not exceed 1.5 metres.
- (e)** Branch circuits feeding receptacles and power grids shall not share neutrals. An individual dedicated neutral shall be run for each circuit.
- (f)** An insulated green bond wire shall be run to every conduit and every receptacle. Bond wire may be shared.
- (g)** Lighting circuits shall not share neutrals.
- (h)** Multiple conduit runs shall be grouped on suspended channels (Unistrut) with minimum of 25% spare usable space for future runs.
- (i)** Pull boxes shall be provided every 16 meters or less for all conduit runs.

- (j) Pull box and junction box covers shall be provided with colour markings and/or permanent marker printing to indicate contents or designated purpose (power, communication, data and voice, fire alarm, building automation and security, etc.). Colour marking shall be approved by Departmental Representative prior to implementation.
- (k) Receptacle boxes shall be mounted on or between studs with appropriate bracing to assure that receptacle boxes are securely mounted and that boxes for communication outlets are mounted adjacent to power outlets with consistent 100 mm clear separation between boxes.
- (l) Raceways are to be color coded or identified at points where they enter and exit a wall, ceiling, or floor and at intervals not exceeding 15 metres.
- (m) Mounting height of all devices to comply with accessibility guidelines issued by Treasury Board and per current CSA-B651-04.

**7.6.3. Centralized Distribution Panelboards and Panel Boards**

- (a) 120/240V Centralized Distribution Panelboards (CDP) shall have copper bus bars and be complete with main breaker for local isolation purposes.
- (b) Panel boards shall be equipped with locks and keyed alike.
- (c) All panel boards used for electronic equipment shall be equipped with a Type 2 Surge Protection Device as defined in UL 1449 (3<sup>rd</sup> Edition).
- (d) Panel boards shall be located within the area that it serves and shall only feed circuits on the same floor.
- (e) Where required by Code, GFCI breakers and arc flash breakers shall be used.
- (f) Every panel board shall have a minimum of 20% spare capacity when construction is complete. Each panel board shall have a typewritten directory with unique descriptors for each circuit.
- (g) Lighting panel boards:
  - (1) Panel boards used for lighting shall be located in electrical / mechanical rooms on the floor that is served by the respective panel. Lighting circuits shall not be sourced from receptacle panels.
  - (2) Low Voltage Control Panels shall be complete with relays, control power transformers, astronomical time clocks, input/output modules, photocell and Controller Module. Panels shall have provision to interface with additional panels as shown on the Drawings. Low Voltage Relay Panels shall be capable of flick warn and time-out functions in addition to programming times schedules and shall be connected to the BMS (DDC).

**7.6.4. Duplex Receptacles**

- (a) General
  - (1) Receptacles shall be rated at 15/20A and 125V, ivory nylon, specification grade. Provide tamper resistant receptacles where shown and as required by Code.
  - (2) Ground Fault Circuit Interrupting receptacles (GFI) shall be rated at 15/20A and 125V, ivory nylon, specification grade. GFI shall have indicator lamp and be tamper resistant where required by Code.
  - (3) Ground Fault Circuit Interrupting receptacles (GFI) located outside shall be rated at 15/20A and 125V, ivory nylon, specification grade. GFI shall have indicator lamp and be tamper resistant where required by Code.

Provide wet location cover plates which provide a seal whether or not a plug is inserted into the receptacle.

- (4) Surge protection device (SPD) receptacles shall be rated at 15/20A and 125V, nylon, specification grade. SPD receptacles shall be blue in color, type 2 and tested to UL 1449 standards.
  - (5) Outlet cover plates shall be brushed stainless steel.
  - (6) Receptacles in the Covered Inspection Lane shall be mounted at a height of 1200 mm above the finished floor.
  - (7) Refer to Room Data Sheets for further information.
- (b) Circuit Loading**
- (1) Adjacent receptacles shall be on alternating circuits, except in offices (one circuit only per regular office).
  - (2) One dedicated circuit shall serve each regular sized office or the equivalent office space where partition walls between offices can be retrofitted.
  - (3) Not more than two receptacles shall be served by one circuit in all other areas.
  - (4) Regular Offices: All offices shall have two duplex receptacles in each partition wall, one each adjacent to the communication outlet; in addition, one duplex receptacle each shall be located in the corridor wall next to the doorway.
  - (5) Large Offices: Each partition wall shall have a duplex receptacle for each 2 metres of wall and space, a maximum of 2 meters apart.
  - (6) Corridors & Lobbies: One 120V 15/20A 'T' slot receptacle shall be provided such that no point will be more than 4 metres from an outlet.
  - (7) Exterior Walls and Roof: 120V/15 A weatherproof GFI duplex receptacle with metal covers shall be provided every 20 meters and at the covered canopy. Associated circuits shall be entirely dedicated to exterior receptacles only to permit isolation when not in use. Not more than two receptacles shall be on one dedicated GFI circuit.
  - (8) Provide a minimum of one circuit for every two workstations.
  - (9) Provide power connections for system furniture workstations.

**7.6.5. Stand-by Power**

**(a) General**

- (1) The building complex will be backed up 100% by stand-by power from a diesel generator. The Generator shall meet or exceed latest edition of C282 – Emergency Electrical Power Supply for Buildings.
- (2) The contractor to allow for a connection to minimum size of 100 kW, 120/240V single phase diesel generator. The contractor shall base the calculated load on the entirety of the project and size the generator to provide 100% stand-by power. In case of Utility power failure, the generator shall be able to provide 100% power to provide continuous client operation. Diesel generator is provided by others.

**(b) Automatic Transfer Switch**

- (1) Provide an open transition automatic transfer switch c/w manual single by-pass/isolation capabilities to allow for servicing. Transfer switch to allow regular on-line testing using building load without affecting load.
- (2) Control features shall include:
  - (A) Touch pad programming of features and settings without the need for meters, variable power supplies and reference manuals.
  - (B) On-board diagnostics provide control panel and ATS status information to analyze system performance.
  - (C) Displays and counts down active timing functions.
  - (D) Password protection to prevent unauthorized tampering.
  - (E) Serial communications board (RS-422/485 protocol) for viewing adjustments capable of remote monitoring complete with relevant software and via web monitoring communications products.
- (3) Voltage and Frequency Sensing
  - (A) Under and over frequency settings on normal and emergency.
  - (B) True RMS Voltage Sensing with +/-1 % accuracy; Frequency Accuracy is +1-0.2%.
  - (C) Phase sequence sensing or time delay neutral for phase sensitive loads.
- (4) Status and Control Features
  - (A) Output contacts for engine-start signals.
  - (B) Advanced in phase algorithm that automatically measures the frequency difference between the two sources and initiates transfer at appropriate phase angles to minimize disturbances from transferring loads.
  - (C) Event log displays 99 logged events with the time and date of the event, event type and event reason.
  - (D) Output signals for remote indication of normal and standby source acceptability.
  - (E) Statistical ATS/System monitoring data screens which provide:
    - (i) Total number of ATS transfers.
    - (ii) Number of ATS transfers caused by power source failure.
    - (iii) Total number of days ATS has been in operation.
    - (iv) Total number of hours that the normal and standby sources have been available.
  - (F) Time Delays
    - (i) Engine start time delay – delays all engine starting signals to override momentary normal source out-ages – adjustable 0 to 6 seconds.
    - (ii) Transfer to standby time delay – adjustable 0 to 60 minutes.
    - (iii) Standby source failure time delay to ignore momentary transients during initial generator set loading – adjustable 0 to 6 seconds.
    - (iv) Retransfer to normal time delay with two settings:
    - (v) Power failure mode – 0 to 60 minutes.

- (vi) Test mode – 0 to 60 minutes.
- (vii) Unloaded running time delay for engine cool down – adjustable 0 to 60 minutes.
- (viii) All alarm signals, logic and time delays for use with closed transition switches.
- (ix) In synch time delay – 0 to 3 seconds.
- (x) Failure to synchronize -1 to 5 minutes.
- (xi) Extended parallel – 0.1 to 1.0 seconds.
- (G) Controls and Indicators
  - (i) Switch position indicating lights (16 mm, industrial grade LEDs).
  - (ii) Source acceptability indicating lights with true indication of the acceptability of each source, as determined by the voltage, frequency, voltage unbalance, and phase sequence settings of the control panel (16 mm, industrial grade LEDs).
  - (iii) Three position (16 mm, industrial grade type) selector switch:
    - (iv) Automatic: Normal maintained position
    - (v) Test: Momentary position to simulate normal source for system test function.
    - (vi) Reset Delay Bypass: Momentary position to bypass transfer and re-transfer time delay.

#### 7.6.6. Wiring Systems

##### (a) General

- (1) With the exceptions listed below, all wiring for all systems shall be run in minimum 21mm EMT conduit.
- (2) Final 3 meters of power cabling to panel boards, transformers, motors, may be run in flexible conduit. TECK cable is also acceptable up to three metres in length.
- (3) Final connections to light fixtures in concealed ceiling spaces may be run inflexible conduit. AC 90 (BX) is also acceptable up to 1.5 metres in length.
- (4) Provide neat U-channel supports to group multi conduit/cable runs.
- (5) All junction boxes, pull boxes etc. (located in concealed ceilings, electrical rooms, mechanical rooms, telephone closets, mechanical / electrical closets, parkade ceilings etc) shall be colour coded and marked clearly in indelible black ink, the system and contents they contain.

##### (b) Wire and Cable

- (1) Wire shall be RW75 copper. RW90 may be used but ampacity rated at 75 degrees.
- (2) All Cable shall be FT-4 rated except where FT-6 rating is required.

#### 7.6.7. Grounding and Bonding

##### (a) General

- (1) Grounding and Bonding shall meet the Canadian Electrical Code Requirements.
- (2) Ground wire and bond wires shall be bare soft drawn, standard copper.
- (3) Inaccessible ground system connections shall be made using exothermic connections.
- (4) All conduit runs containing feeders and branch circuits shall be complete with an insulated green bond wire bonded to all outlet boxes, junction boxes, pull boxes, equipment enclosures, etc. The conduit system shall be continuous but shall not be relied on to serve as the equipment bonding means.
- (5) Multi-conductor TECK feeders shall utilize the integral bond conductor or sheath unless otherwise noted.
- (6) Bond communication system as per ANSI/TIA 607.

**7.6.8. Electric Heating**

**(a) General**

- (1) Use of electric heaters for space heating is discouraged. Mechanical shall provide requirements.
- (2) following spare parts: two sets of spare fuses for each rating used.

**7.6.9. Variable Speed Drives**

- (a) Where motors are controlled through Variable Frequency Drives (VFD), these drives shall be located separately adjacent to the respective motor. Non-fused switches must be provided to allow isolation of variable speed drives.
- (b) Drives shall be supplied with line reactors and long lead filters as required by the drive suppliers.
- (c) Drives shall have the following functions and features:
  - (1) User friendly interface features with large clear LED Screens
  - (2) Self Diagnostics
  - (3) Programmable range of frequency skip (minimize mechanical resonance effects)
  - (4) Capable of continuous operation in a 40C ambient
  - (5) Drives minimum acceptable standards to be ABB.
  - (6) Only drives with a factory trained and authorized repair service located within a 15 hour service window are allowed.
- (d) Drives with manual bypass shall not be permitted to use across the line starting.

**7.6.10. Lighting**

**(a) General**

- (1) Lighting design shall be in general compliance with the current edition of the IES Lighting Handbook (10<sup>th</sup> Edition and IESNA G-1-03 Guideline for Security Lighting for People, Property, and Public Spaces) with respect to energy efficiency and illumination levels.
- (2) Lighting control shall be via a low voltage relay panel and relays for general area lighting in combination with line voltage occupancy, vacancy and daylight sensors for rooms.

- (3) Luminaires shall have low EMI emission, low harmonic distortion and high power factor.
  - (4) Light switches and control devices shall be ivory in colour; cover plates are to be brushed stainless steel.
- (b) Indoor Lighting**
- (1) Indoor luminaires to be connected to 120V.
  - (2) All luminaires to be controlled from the approved energy control system, (or an approved equal system), or line voltage automatic controls. Dimming ballasts, where required, shall be compatible with the lighting control system.
  - (3) All fluorescent fixtures shall utilize extra-long life T8 25Watt lamps and programed start ballasts.
  - (4) LED lit luminaires shall meet the LM-79 and LM-80 test protocols (70% output at 50,000 hours), a minimum efficacy of 60 lumens per watt and shall meet or exceed ENERGY STAR SSL standards to ensure lumen and color consistency between luminaires.
  - (5) LED drivers shall be fully dimmable, Energy Star compliant, maximum THD of 20%, power factor to be greater than .95, have high voltage regulation and have internal surge protection.
  - (6) Acrylic lenses shall be K12A type and easily removable for re-lamping (hinged covers).
  - (7) Entrances, exposed structure ceiling areas and the service counters will require specialized lighting. Provide samples to Departmental Representative for approval.
  - (8) Service closets shall be equipped with strip fixture with wire guards. Incandescent lamps are not permitted.
  - (9) Mechanical / electrical rooms shall be equipped with minimum two strip fixture with white reflector shields and wire guards.
  - (10) Permanent night lighting shall be provided for building entrance areas.
  - (11) Lighting Control – All interior luminaires shall be designed and laid out to accommodate lighting control by local switches or sensors via the low voltage lighting system or line voltage for enclosed rooms.
  - (12) Light switching of offices, workshops, meeting rooms, etc., shall also be controllable individually for each room. Controls shall be manual on, automatic off.
  - (13) Lighting in meeting rooms shall be indirect or volumetric augmented with down lights and be fully dimmable.
  - (14) All down lights shall be LED; compact fluorescent technology shall not be used.
  - (15) Down lighting shall be provided directly above the service desk.
  - (16) In general, night lights (24 hour) shall only be switchable at the breaker.
  - (17) Lighting shall be controlled or overridden by wall switches with brushed stainless steel cover plates, or with dimmer switches compatible with the low voltage system.
  - (18) Occupancy sensors and vacancy sensors shall be dual technology and be installed on the wall where switching required and ceiling mounted in washrooms and other similar areas.

- (19) Daylight sensors shall be installed where required by ASHREA 90.1 requirements and be compatible with low voltage lighting system when connected to the low voltage system.
  - (20) Light fixtures located in office areas shall be volumetric or premium specification grade troffers. Housing shall be cold-rolled steel..
  - (21) Building exterior lighting shall be LED, vandal resistant, full cut-off and dark sky compliant.
  - (22) Lighting design shall meet the maximum power density and control requirements as per ASHRAE 90.1.
  - (23) All fixtures shall be CSA Approved.
  - (24) The average lighting level to be as follows:
    - (A) Building Entrances & Exits 300 Lux
    - (B) Common Lobbies 300 Lux
    - (C) Common Lobbies & Stairways 200 Lux
    - (D) Common Washroom 300 Lux
    - (E) Storage Areas 300 Lux
    - (F) Illumination level in all office areas, meeting rooms, administration and all other areas not specified above shall have a maintained average of 500 Lux at 750mm above finished floor.
  - (25) For all lighting levels, the uniformity ratio to be 3:1 (max/min) and for indirect lighting systems, ceiling brightness to be 8:1 (max/min).
- (c) Outdoor Lighting
- (1) General
    - (A) Roadway lighting – 14 lux 3:1 Average to minimum
    - (B) Main and Secondary Inspection Canopies – Dimmable with daylight sensor, 5 FC (55 lux) 3:1 Average to minimum
    - (C) Parking Facilities – 1 FC (11 lux) 6 lux minimum (Fig 22.20. IES)
    - (D) Assume roadways are expressways (IES Part 9). Provide lighting for safe stopping sight distances. All paved areas are considered roadways.
    - (E) Goal of the site lighting is to provide an even, welcoming lighting which allows for easy identification as required for the task while providing a low operating and maintenance cost.
    - (F) Allow for lighting system depreciation of 20%. Above figures are maintained values – not initial values)
    - (G) Pedestrian areas – use figure 22-10 (IESNA lighting handbook – tenth edition) where walkways exist. Provide lighting for pedestrian security where required. Assume road surface classification is type R3 (IESNA lighting handbook).
    - (H) Provide transition lighting on approach to inspection areas. Provide Provincial Transportation lighting levels if values are greater or standard is stricter than above. Control driver and inspection area glare and veiling luminance through reflectors and proper lens selection. Use indirect lighting with care. If recommended, provide safeguards against bird roosting, dirt accumulation. Do not use 100% indirect lighting; allow for a minimum or 20% direct lighting. All site lighting shall be LED and quality fixtures with low light pollution and full cut-off. LED

gasketed wrap around prismatic, moulded injected acrylic type rated for outdoor use can be considered for inspection areas. Poles shall incorporate low maintenance cost techniques. Use hinged pole bases to allow for easy maintenance. Fixture height shall be no higher than 9 meters. Pole bases in areas prone to damage from snow plows or vehicles movement shall have 1.2 meter high concrete bases. Switching of exterior lighting must be through one common photocell output signal and multi channel / control through astronomical time clock with override capability for testing. Provide lighting above all man / overhead doors.

- (I) All canopy lighting shall be recessed into metal soffit.
- (2) Exterior Signage
  - (A) Illuminate Client provided Canada wordmark sign on the elevation of the Main Port facing the international border.
  - (B) Lighting shall be LED and controlled by a photocell with override switches to be controlled same as building exterior lighting.
- (d) Emergency Lighting
  - (1) Unit equipment for emergency lighting shall be provided to meet National Building Code requirements. In addition selected areas are to receive emergency lighting for operational requirements.
  - (2) The emergency lighting system shall be tested for maintained luminance to a minimum of 1 hour. Provide written document verifying the operation of the system after the test.
  - (3) Emergency lighting shall be on a lighting circuit that is served by the emergency lighting system.
  - (4) The contractor shall ensure conductor size is suitable for the emergency lighting system to maintain a minimum of 3% volt drop to remote heads.
  - (5) Battery packs located in generator rooms shall be sized for 2 hours have self-diagnostic circuitry and a surge protection device on the supply side.
  - (6) Remote heads for the emergency lighting system shall be of the LED type.
  - (7) Provide independent battery pack lighting at emergency generator, automatic transfer switch, electrical rooms and mechanical rooms.
- (e) Exit Signs
  - (1) Exit signs shall be long life green LED pictogram style.
  - (2) Exit signs to be connected to the Emergency Lighting Unit Equipment; self-contained exit signs are not permissible.
  - (3) The exit lighting system shall be supplied by a lockable dedicated overcurrent device.
  - (4) Emergency exit signs shall be per latest edition of National Building Code.(NBC)
  - (5) Exit signs must meet CSA C860, 22.2 No. 141-10 and ISO 7010 standards. Exit sign wiring to be installed in separate conduit and conductors to be #12 AWG with RW90 X-link insulation. Building Communications Systems

#### 7.6.11. Local Exchange service TELEPHONE / DATA SYSTEMS

- (1) Contractor shall supply and install a complete communications cabling system infrastructure which includes conduits, junction boxes, mud rings,

pull wires, grounding, cable tray etc. Size of all conduits and cable tray to be based on one voice, one data and one spare CAT6 cable at each workstation. Shared Services Canada will provide communication cabling. Contractor shall take responsibility for coordination to assume Shared Services Canada as Contractor's sub-trade.

- (2) The Design Build Contractor shall provide an empty raceway and cable tray system as described below for the Communication wiring.
- (3) The Design Build Contractor shall install a raceway system generally as follows:
  - (A) Three 78 mm diameter EMT conduits shall be provided for backbone cable between the main termination and other main communications distribution points.
  - (B) Partitioned basket type cable trays shall be installed to permit the horizontal routing of telephone and data cables on **throughout floor**. They shall start at the telecom closet and running along the entire length of each floor within the ceiling space so that the cable tray can be easily accessed from each service closet.
  - (C) Cable trays shall avoid 90 degree turns and vertical offsets. All turns and vertical offsets must be curved.
  - (D) One 27 mm EMT conduit shall be installed from the cable tray to each communication outlet location, terminating in an outlet box which is covered by a stainless steel cover plate. Short horizontal runs of "J" hooks (6 meters) shall be allowed as long as bonding is maintained. The outlet box for each communication outlet to be double gang square box complete with single gang mud ring.
  - (E) Horizontal conduit runs in walls are not permitted.
  - (F) All communication conduits must be furnished with pull strings. All communication conduit ends be furnished with fixed bonding bushings. Provide plastic bushing at communication outlet termination for conduit. Verification of conduit requirements for the communication system is required prior to installation.
  - (G) Each tray to be supplied with a #6 AWG bare grounding wire, bonded every 50 ft. Bonding bushings from each conduit run to be bonded to tray ground. Leave 3 m of bond wire coiled in Telecom Closet.
  - (H) Supply and install receptacles as indicated on drawings, each on dedicated breaker and fed from standby power, in each Telecom Closet.
  - (I) PIL booths require multiple conduits for power and communications. Provide conduits for communication outlets identified on the electrical drawings.
  - (J) Provide a complete set of drawings showing the entire communications infrastructure in ACAD format to "Shared Services Canada" for approval.
  - (K) Sizes of electrical, communication cabling, sewage and other services for the temporary trailers shall be the same as for the new facility. Contractor shall coordinate with client before ordering services from service providers.

#### 7.6.12. Fire Alarm System

- (a) General**
  - (1)** Provide, install and verify a complete fire alarm system in accordance with the Drawings and current applicable Codes.
  - (2)** The fire alarm system shall be installed in compliance with the National Fire Code of Canada, National Building Code, the Standard for Installation of Fire Alarm Systems CAN/ULC S524-06 the Standard for Verification of Fire Alarm System installations CAN/ULC-S537-04 and local and municipal Codes.
  - (3)** All fire alarm system wiring shall be installed in Class A configuration; in conduit and all conductors shall minimum be #14 AWG wire. Provide 2 hour rated cabling where required by Code. Hybrid class 'A' systems shall not be acceptable. Paint all junction boxes red.
  - (4)** Overcurrent device supplying power to the panel shall be located as close as possible to the main overcurrent device, lockable and painted red.
  - (5)** The fire alarm system shall be zoned, non-coded single stage, fully supervised and microprocessor based addressable. Status and trouble signals from genset to be indicated on fire alarm annunciator.
    - (A)** Main panel shall have remote system's LED panel annunciation fully integrated with that of main panel.
    - (B)** The text messages of the system's device annunciation shall be structured under the direction of the Departmental Representative or the Fire Commissionaire of Canada.
  - (6)** Wire to and connect all dampers, fan controls, fire suppression systems, sprinkler flow and tamper devices, door hold-open devices, access controlled doors, generator transfer switches and monitoring company as indicated on the Drawings and monitor devices as required by CAN/ULC S524-06.
  - (7)** The entire Fire alarm system shall be of one manufacturer.
- (b) Fire Alarm Devices**
  - (1)** Manual pull stations, smoke and heat detectors shall be addressable single stage.
  - (2)** Audible and audible/visual signal devices shall be addressable.
  - (3)** Annunciation panels shall be located where required by code (main entrance). The main fire alarm panel shall be located in the port building. Commercial building's fire alarm panel shall be connected to the port building's panel and all the zones within commercial buildings shall be shown on the Annunciator Panel.
  - (4)** All fire alarm devices shall be bilingual.
  - (5)** Allow for connection to generator status and trouble.
  - (6)** Emergency Evacuation Plan: Provide this plan and identify all fire extinguishers, fire extinguisher cabinets, fire pull stations, exits, fire alarm annunciator, and control panel. The plan should clearly shows all the devices for all the floors, each building and PIL booth both in PDF and ACAD. The plan must installed in each critical exit and building with note Mark: "You are here" on each plan.
  - (7)** Fire exit doors shall have remote release.
- (c) System Verification**

- (1) The Manufacturer's technician will direct the Performance Verification of Fire Alarm System in accordance with CAN/ULC-S537-04, Standard for Verification of Fire Alarm System Installations.
- (2) Prior to requesting performance verification by the Technician, ensure that the fire alarm system is fully operable and that subsequent work to be performed on system will not invalidate examinations and tests performed during verification procedure.
- (3) The electrical contractor to include in the tender all costs for fire alarm system verification and any additional costs to change or alter operation or installation to meet intent of the specification or regulatory code requirements.

**7.6.13. Intercom System**

**(a) General**

- (1) Intercom is anticipated to be of the phone system. No dedicated intercom or wiring is proposed.

**7.6.14. Closed Circuit Television (CCTV)**

**(a) General**

- (1) The video surveillance cameras, monitors and wiring shall be supplied and installed by others. Contractor shall provide conduit and pathways only.

**7.6.15. Traffic Lights**

- (a) Two sets of traffic lights (red and green) shall be provided on the entry face of the Covered Inspection Lane. One shall be mounted 1.50m from above finished grade to the bottom of the light and the other centred above the overhead door.
- (b) All shall be LED and clearly visible during daytime operation.
- (c) Provisions shall be made to ensure shielding of daylight.
- (d) Signage control shall be hardwired to each booth and connected to minimum two offices designated by Departmental Representative.

**7.6.16. Duress Alarm System**

**(a) General**

- (1) The duress alarm system shall be supplied and installed by others. Contractor shall install conduit pathways to all duress system devices shown on the electrical drawings. The locations of the button and speaker are indicated on the electrical Conceptual Drawings.
- (2) Number of duress alarms are as followed (traffic and commercial combined):
  - (A) 1 per PIL booth position = 2
  - (B) 1 per front counter position = 1
  - (C) 1 per interview room = 1
  - (D) Annunciator panels: 1 per superintendent office plus 1 in remote monitoring room adjacent to PIL #1 (main building)
  - (E) 3 indicator lights (strobe) per building

**7.6.17. PIL Booth**

- (a)** General
  - (1)** Supply and install power panels, data, telephone and other services and connection for the PIL booths. Refer to Appendices for further information.
  - (2)** Dedicated LED lighting shall be provided to illuminate the inspected vehicles' driver and passenger irrespective of vehicle sizes.

**7.6.18.** PASS Radio

- (a)** General
- (b)** Supply and install a complete conduits system and power for the PASS Radio System. Coordinate with Departmental Representative for exact locations. Intrusion Alarm System

**7.6.19.** Intrusion Alarm

- (a)** General
  - (1)** Intrusion alarm devices and wiring are installed by others. Contractor shall install a complete conduit system and power for the intrusion alarm system. Coordinate with Departmental Representative and electrical drawings for exact locations.

Stewart Port of Entry Redevelopment  
Project # R.071365.001

## APPENDIX B – GEOTECHNICAL ASSESSMENT



## **Stewart Port of Entry Development**

FINAL REPORT



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# STEWART PORT OF ENTRY DEVELOPMENT

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# STEWART PORT OF ENTRY DEVELOPMENT

Introduction  
January 23, 2014

## 1.0 Introduction

Stantec Consulting Ltd. (Stantec) has completed a geotechnical assessment for the proposed Stewart port of entry development, located at the Canada/USA international border crossing in Stewart, BC.

The purpose of this assessment was to characterize the subsurface soil conditions and provide geotechnical recommendations for design and construction of the proposed development. The scope of work for the assessment consisted of a geotechnical site investigation and drilling program, engineering analysis, and the preparation of this geotechnical report.

## 2.0 Project and Site Description

Based on the Terms of Reference (ToR), dated September 10, 2012, and the Conceptual Site Plan (Rev 1) dated September 2013, provided by Public Works and Government Services Canada (PWGSC), Stantec understands that the proposed development consists of a new border crossing facility northeast of the existing facility.

Based on the Conceptual Site Plan, the proposed facility will have a connected drive-through canopy and will have dimensions of approximately 18 m by 15 m. Based on discussions with PWGSC and the ToR, the facility will be a single-story modular building. The site is bounded to the east and south by water, to the west by the border crossing and Hyder, Alaska, and to the northwest by the Glacier Highway. The Glacier Highway travels in from the northeast and through the border crossing heading west. The site of the new border crossing facility is generally empty and is partially asphalt covered with vegetation and blast rock fill along the water body. A septic tank and shed are situated south of the site next to the existing border crossing facility.

Aside from the overhead utility lines, no utilities were found within the site.

## 3.0 Geotechnical Investigation

Stantec completed a geotechnical subsurface investigation for the proposed development on December 19 and 20, 2013. The investigation consisted of three (3) sonic test holes. The subsurface investigation was completed utilizing a track-mounted sonic rig operated by Downrite Drilling Ltd. of Chilliwack, BC. The holes were advanced to depths of 5.2 m (17 ft.) to 9.1 m (30 ft.).

The field work was continuously monitored by a Stantec field representative, who located the test holes, classified the soils, kept a detailed log of each borehole, and observed and recorded pertinent site features. Representative soil samples were collected from the boreholes and brought to the Stantec soils laboratory in Burnaby, BC for further visual classification, as well as natural moisture content measurements. The boreholes were carried out at the locations shown on Drawing No. 1 (**Appendix B**).



## STEWART PORT OF ENTRY DEVELOPMENT

Subsurface Conditions  
January 23, 2014

### 4.0 Subsurface Conditions

In general, the subsurface conditions encountered during our subsurface investigation consisted of a surficial layer of asphalt or silty sand fill, underlain by a layer of blast rock fill, further underlain by a layer of clayey silt, which is further underlain by sand and gravel deposit which extended beyond the termination of the boreholes.

The subsurface soil strata and groundwater conditions encountered in the boreholes are described in detail on the Borehole Records (**Appendix C**). Additional details regarding the soils encountered are presented below.

#### Surficial Fill

An approximately 0.15 m (6 inches) thick layer of silty sand fill was encountered in TH13-02. TH13-01 had an asphalt cover.

#### Blast Rock Fill/Till Fill

A blast rock fill and till-fill mixed layer was encountered below the surficial fill. The fill had a thickness of approximately 3.0 m (10 ft.) to 3.4 m (11.1 ft.). The material encountered in this layer consisted of varying amounts of sand and gravel mixed with cobbles and boulders of bedrock fragments.

#### Clayey Silt

A native deposit of grey clayey silt was encountered below the blast rock fill. This clayey silt deposit contained some organics and was approximately 0.6 m (2 ft.) to 0.75 m (2.5 ft.) in thickness. This layer was encountered in TH13-02 and TH13-03, and was generally firm to stiff.

#### Sand and Gravel

A native deposit of grey sand and gravel was encountered below the clayey silt. The amount of sand and gravel varied with depth and cobbles were encountered occasionally. TH13-01 was terminated in this layer at a depth of 5.2 m, and TH13-02 and TH13-03 were terminated in this layer at a depth of 9.1 m.

#### Groundwater

The groundwater table was not encountered during our subsurface investigation within the boreholes. However, the site is adjacent to a large water body and based on the Conceptual Site Plan, the site is between Elevations 5.5 m to 6.1 m (Geodetic). The depth of the groundwater table is likely approximately 6.0 m below existing grades, but seasonal variations should be expected. Effects of precipitation will likely be limited by the adjacent water body, but groundwater elevation changes of up to 0.5 m should be expected due to tidal fluctuations.



# STEWART PORT OF ENTRY DEVELOPMENT

Discussion and Recommendations  
January 23, 2014

## 5.0 Discussion and Recommendations

### 5.1 GENERAL

Based on the results of the Stantec field work, laboratory testing and engineering analyses, the main geotechnical findings are as follows:

1. Existing soil conditions generally consisted of blast rock fill, underlain by native clayey silt, which is further underlain by a sand and gravel deposit;
2. Conventional spread footings founded on the blast rock fill is suitable for the proposed development, provided the foundation subgrade is prepared as described in Section 5.2;
3. Based on the results of the Stantec subsurface investigation, it is considered appropriate to classify the seismic site response as Site Class C (in accordance with the 2012 British Columbia Building Code (BCBC), which was adopted from the 2010 National Building Code of Canada (NBCC)).

The following sections of this report present our geotechnical recommendations for the proposed development. Recommendations for the development are based on information obtained from the field investigation and the engineering analyses.

Terminology and specifications for aggregates and granular materials used in subsequent sections in this report are in accordance with the Master Municipal Construction Document (MMCD) Volume II, 2009 Edition, developed jointly by the Consulting Engineers of BC, the BC Road Builders and Heavy Construction Association, and the Municipal Engineers Division of the Association of Professional Engineers and Geoscientists of BC.

### 5.2 SITE PREPARATION

Existing asphalt and silty sand fills should be stripped from the proposed structure area. As the fill beneath the surface consists of blast rock fill, no rocks ("hard points") greater than 6 inches in diameter should be within 0.3 m (1 ft.) of the base of the foundations. Areas with hard points within 0.3 m of the base of the foundation should be sub-excavated and replaced with structural fill (as described in Section 5.3) compacted to at least 100% Standard Proctor Maximum Dry Density (SPMDD).

The exposed subgrade surface should be proof-rolled to the satisfaction of a geotechnical engineer; any soft or loose soils should be sub-excavated and replaced with structural fill compacted to at least 100% SPMDD.

Underground utilities were not encountered and only overhead utilities were found during the subsurface investigation. However, the contractor will be responsible for identifying any utilities within the site at the time of construction.



## **STEWART PORT OF ENTRY DEVELOPMENT**

Discussion and Recommendations  
January 23, 2014

### **5.3 STRUCTURAL FILL AND BACKFILL SPECIFICATIONS**

Structural fill should consist of pre-approved 75 mm (3 inch) minus pit run sand and gravel (MMCD, Section 31 05 17, Item 2.3) pit run sand (MMCD Section 31 05 17, Item 2.4). Structural fill should be placed in maximum 300 mm lifts and compacted to at least 100% SPMDD. Inspection and testing by a certified testing agency and review by the professional on record will be required during construction to ensure all fill used is suitable and is placed and compacted to the required specifications such that the obligations specified in the British Columbia Building Code Letters of Assurance, and federal letters of assurance, if applicable, are met.

### **5.4 FOUNDATION DESIGN**

We consider that the proposed structure can be supported by conventional spread footings founded on the blast rock fill or till-fill, provided the area has been prepared as described in Section 5.2.

Under the Serviceability Limit States (SLS) design, pad and strip footings founded on the blast rock fill or till-fill can be designed for a soil bearing resistance of 250 kPa (5,200 psf). Under the Ultimate Limit States (ULS) design, a factored ultimate bearing resistance of 400 kPa (8,350 psf) can be utilized, which is based on the geotechnical resistance factor of 0.5 for shallow foundations.

Strip and pad footings should have minimum widths of 450 mm and 600 mm, respectively. All footings should be founded at least 900 mm below final grade for protection against frost action. All bearing surfaces for footings should be dry and free of loose or deleterious materials prior to the placement of concrete. Where construction is undertaken during winter conditions, the foundation bearing soils should not be allowed to freeze, and in no case should frozen soil be used as structural fill.

### **5.5 SLAB-ON-GRADE**

If required, the floor of the facility may be constructed as a slab-on-grade provided the site preparation as described in Section 5.2 is carried out over the entire facility area. The slab-on-grade floor should be underlain by a minimum of 150 mm of 19 mm minus crushed gravel (MMCD, Section 31 05 17, Item 2.10) compacted to at least 100% SPMDD.

To inhibit the migration of moisture, the slab-on-grade should be separated from the underlying drainage layer by a 10 mil thick polyethylene vapour battier. Adjacent sheets of vapour barrier should overlap a minimum of 600 mm.

### **5.6 SUBGRADE WALLS**

Any proposed subgrade walls (i.e., loading dock retaining walls, etc.) should be designed to resist static lateral soil pressures and dynamic lateral pressures induced by seismic activity. For subgrade walls up to 3 m in height, lateral earth loads should be calculated on the basis of a uniform pressure of 20 kPa. This pressure includes both static and seismic loading.

## STEWART PORT OF ENTRY DEVELOPMENT

Discussion and Recommendations  
January 23, 2014

If positive drainage is not provided in the backfill behind the subgrade walls, full hydrostatic pressures should be included in the calculation for lateral loads. In order to reduce hydrostatic pressures that may build up in the backfill, subgrade walls should be backfilled with a minimum 450 mm wide zone of free-draining backfill. The free-draining backfill should extend to within 600 mm of final grade.

### 5.7 EXCAVATIONS AND DEWATERING

Excavations within soils deposits greater than 1.2 m must have side slopes no steeper than 1H:1V (horizontal to vertical). Temporary excavations of greater depth will require site-specific recommendations or the use of a temporary shoring system. Excavations should be inspected regularly for signs of instability and the slopes flattened, if required. All excavations should be carried out in accordance with Worksafe BC regulations.

It is not anticipated that groundwater will be encountered in shallow excavations (i.e., less than 1.2 m below surrounding grades). However, excavations must be kept dry during construction. We consider that dewatering, if required, can likely be handled by conventional sumps and pumps.

### 5.8 PAVEMENT DESIGN

For the new pavement sections to be added as a result of the new border crossing facility, it is assumed that they will be used primarily by passenger vehicles. Assuming soil conditions at the test holes locations are encountered along the entire road alignment, after stripping and proof-rolling the exposed soils, the new pavement structure should be as defined in **Table 1**.

**Table 1: Recommended Minimum Pavement Section**

Description	Roadway
Asphalt Pavement	65 mm
19 mm minus crushed gravel base (MMCD, Section 31 05 17, Item 2.10)	150 mm
Select Granular Sub-base (MMCD, Section 31 05 17, Item 2.8)	300 mm

All granular materials should conform to the specifications outlined in the Master Municipal Specifications and should be approved by the professional on record prior to use. The base and sub-base materials should be compacted to at least 100% SPMDD. Asphalt should be compacted to at least 95% of 50 blow Marshall density.

### 5.9 SEISMIC CONSIDERATIONS

Seismic design for “normal structures”, such as warehouses, low-rise commercial buildings and high-rise office towers is based on the 2010 NBCC, which was adopted in the 2012 BCBC. The primary objective of the NBCC earthquake resistant design requirements is to prevent major structural failure and the loss of life. Structures designed in conformance with the NBCC provisions should be able to resist earthquakes without collapse. Collapse is defined as a state in which occupants can no longer exit the building because of structural failure. The latter implies that key components of the building and supporting foundations

## STEWART PORT OF ENTRY DEVELOPMENT

Closure

January 23, 2014

necessary to ensure the building's post-earthquake stability must be protected against collapse under design levels of shaking.

According to the 2010 NBCC, the maximum earthquake ground motion is defined as having a probability of exceedance of 2% in 50 years (i.e., the 2,475 year return period earthquake). The design peak ground acceleration (PGA) for the Port of Stewart is 0.146 g (g = acceleration due to gravity). Based on the results of the Stantec field investigation and the subsurface conditions encountered, it is considered appropriate to classify the seismic site response as Site Class C.

While some damage to the structure would be expected under the influence of the 2010 NBCC design earthquake event, it is not anticipated that collapse of the structure would occur due to foundation failure, and the intent of the building code would be achieved.

### 6.0 Closure

This report was prepared for the exclusive use of Public Works and Government Services Canada (PWGSC) and their agents. Any use of this report or the material contained herein by third parties, or for other than the intended purposes, should first be approved in writing by Stantec.

The recommendations contained in this report are based on assumed continuity of soils with those of our boreholes, and building design grade near existing grades. Stantec should be provided with the final architectural and structural drawings when they become available in order that we may review our design recommendations and advise of any revisions, if necessary.

Use of this report is subject to the Statement of General Conditions provided in **Appendix A**. It is the responsibility of PWGSC, who is identified as "the Client" within the Statement of General Conditions, and its agents to review the conditions and to notify Stantec should any of these not be satisfied. The Statement of General Conditions addresses the following:

- Use of this report
- Basis of the Report
- Standard of Care
- Interpretations of Site Conditions
- Varying or Unexpected Site Conditions
- Planning, design or construction

This report was prepared by Kelvin Tai, EIT, and Wayne Quong, M.A.Sc., P.Eng.



Stantec

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**STEWART PORT OF ENTRY DEVELOPMENT**

Closure  
January 23, 2014

Respectfully submitted,

**Stantec Consulting Ltd.**



Kelvin Tai  
Engineering-in-Training

KT/WQ



Wayne Quong, M.A.Sc., P.Eng.  
Senior Associate



**Stantec**

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# APPENDIX A

## Statement of General Conditions



## Statement of General Conditions

**USE OF THIS REPORT:** This report has been prepared for the sole benefit of the Client or its agent and may not be used by any third party without the express written consent of Stantec Consulting Ltd. (Stantec) and the Client. Any use which a third party makes of this report is the responsibility of such third party.

**BASIS OF THE REPORT:** The information, opinions, and/or recommendations made in this report are in accordance with Stantec's present understanding of the site specific project as described by the Client. The applicability of these is restricted to the site conditions encountered at the time of the investigation or study. If the proposed site-specific project differs or is modified from what is described in this report or if the site conditions are altered, this report is no longer valid unless Stantec is requested by the Client to review and revise the report to reflect the differing or modified project specifics and/or the altered site conditions.

**STANDARD OF CARE:** Preparation of this report, and all associated work was carried out in accordance with the normally accepted standard of care in the state or province of execution for the specific professional service provided to the Client. No other warranty is made.

**INTERPRETATION OF SITE CONDITIONS:** Soil Rock, or other material descriptions, and statements regarding their conditions, made in the report are based on site conditions encountered by Stantec at the time of the work and at the specific testing and/or sampling locations. Classifications and statements of condition have been made in accordance with normally accepted practices which are judgmental in nature; no specific description should be considered exact but rather reflective of the anticipated material behavior. Extrapolation of in situ conditions can only be made to some limited extent beyond the sampling or test points. The extent depends on variability of the soil, rock and groundwater conditions as influenced by geological processes, construction activity, and site use.

**VARYING OR UNEXPECTED CONDITIONS:** Should any site or subsurface conditions be encountered that are different from those described in this report or encountered at the test locations, Stantec must be notified immediately to assess if the varying or unexpected conditions are substantial and if reassessments of the report conclusions or recommendations are required. Stantec will not be responsible to any party for damages incurred as a result of failing to notify Stantec that differing site or subsurface conditions are present upon becoming aware of such conditions.

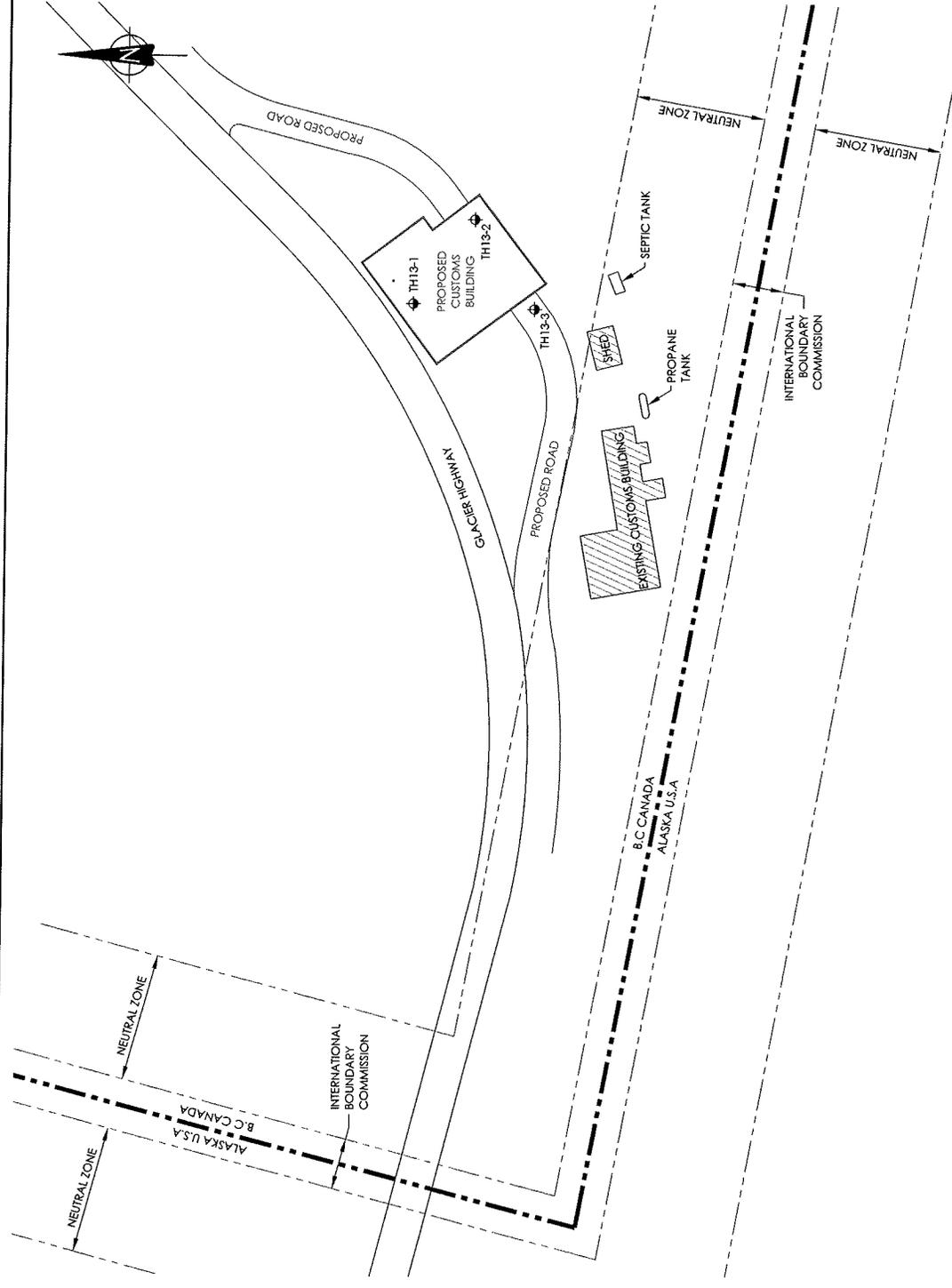
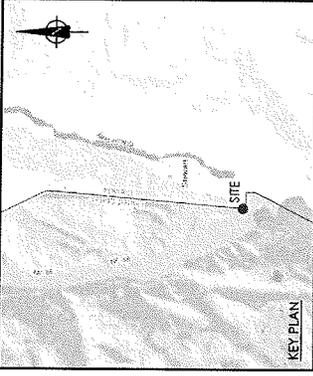
**PLANNING, DESIGN, OR CONSTRUCTION:** Development or design plans and specifications should be reviewed by Stantec, sufficiently ahead of initiating the next project stage (property acquisition, tender, construction, etc.) to confirm that this report completely addresses the elaborated project specifics and that the contents of this report have been properly interpreted. Specialty quality assurance services (field observations and testing) during construction are a necessary part of the evaluation of subsurface conditions and site preparation works. Site work relating to the recommendations included in this report should only be carried out in the presence of a qualified geotechnical engineer; Stantec cannot be responsible for site work carried out without being present.



# APPENDIX B

## Test Hole Location Plan





**LEGEND**

- CANADA/U.S.A. BORDER
- - - INTERNATIONAL BOUNDARY
- ◆ TEST HOLE LOCATION

SCALE IN METRES  
0 5 10 15 20 25  
1:500

NOTE: THIS DRAWING ILLUSTRATES SUPPORTING INFORMATION SPECIFIC TO A STANTEC REPORT AND MUST NOT BE USED FOR OTHER PURPOSES.

Reference:	Job No.:	123311089	Client:	PUBLIC WORKS & GOVERNMENT SERVICES CANADA
	Scale:	1:500	Site Address:	PORT OF STEWART BORDER CROSSING
	Date:	07-Jan-14		
	Dwn. By:	GH		
	App'd By:	KI		
<b>TEST HOLE LOCATION PLAN</b>		<b>GEOTECHNICAL ASSESSMENT</b>		
Dwg. No.:		1		



# APPENDIX C

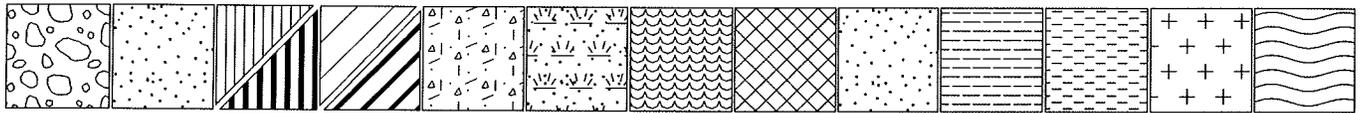
## Borehole Records





# Stantec SYMBOLS AND TERMS USED ON BOREHOLE AND TEST PIT RECORDS

## STRATA PLOT



Gravel & Boulders    Sand    Silt Low/High Plasticity    Clay Low/High Plasticity    Till    Topsoil    Peat    Fill    Sandstone    Siltstone    Mudstone    Igneous Rock    Bedrock

Initial water level reading

Long term water level reading  
(date)

## SOIL DESCRIPTION

Terminology used for describing soil strata based upon the proportion of individual particle sizes present:

less than 10%    Trace    20-35%    Adjective (e.g. silty or sandy)  
10-20%    Some    35-50%    And (e.g. silt and sand)

The standard terminology to describe cohesionless soils includes the state of packing, as determined by laboratory test or by the Standard Penetration Test 'N' -value: the number of blows of 140 pound (64kg) hammer falling 30 inches (760 mm), required to drive a 2 inch (50.8mm) O.D. split spoon sampler one foot (305 mm) into the soil. The state of packing approximately relates to the SPT 'N' value as follows:

State of Packing	'N' Value	Relative Density %	State of Packing	'N' Value	Relative Density %
Very Loose	<4	<15	Dense	30-50	65-85
Loose	4-10	15-35	Very Dense	>50	>85
Medium Dense	10-30	35-65			

The standard terminology to describe cohesive soils includes the consistency, which is based on undrained shear strength as measured by insitu vane tests, penetrometer test, unconfined compression tests, or occasionally by standard penetration tests.

Consistency	Undrained Shear Strength kips/sq.ft.	kPa	'N' Value	Consistency	Undrained Shear Strength kips/sq.ft.	kPa	'N' Value
Very Soft	<0.25	<12.5	<2	Stiff	1.0-2.0	50-100	8-15
Soft	0.25-0.5	12.5-25	2-4	Very Stiff	2.0-4.0	100-200	15-30
Firm	0.5-1.0	25-50	4-8	Hard	>4.0	>200	>30

## SAMPLES

	GS... Grab Sample		RC... Rock Core		NR... No Recovery
	AS... Auger Sample		ST... Shelby tube or thin wall tube		UNDIST .. Undisturbed Sample
	SS... Split spoon sample (Obtained by performing the Standard Penetration Test)		Ps... Piston Sample		

# BOREHOLE RECORD

## TH13-1

CLIENT PUBLIC WORKS AND GOVERNMENT SERVICES CANADA PROJECT No. 123311089  
 PROJECT Geotechnical Assessment DATUM \_\_\_\_\_ NORTHING \_\_\_\_\_  
 LOCATION Stewart Port of Entry, Stewart, BC ELEVATION \_\_\_\_\_ EASTING \_\_\_\_\_  
 DRILLING DATE Dec 19, 2013 DRILLING CO. Downrite Drilling Co. DRILLING METHOD Solid Stem Auger

DEPTH (m)	USC	SOIL SYMBOL	SOIL DESCRIPTION	SAMPLES			<input type="checkbox"/> Insitu Shear Vane (kPa) <input type="checkbox"/> Remoulded Shear Vane (kPa) <input type="checkbox"/> Pocket Penetrometer (kPa) <input checked="" type="checkbox"/> Disturbed Torvane (kPa)				DEPTH (ft)
				TYPE	NUMBER	MOISTURE CONTENT (%)	50kPa	100kPa	150kPa	200kPa	
0		X	FILL - 75mm Asphalt over grey/brown silty Sand and Gravel (till-fill)	GS	1-1	6					0
1	FL	X		GS	1-2	11					2
2	FL	X	FILL - Blast Rock, some cobbles (likely boulders)	GS	1-3						4
3		X									6
4	SP	X	Light brown silty gravelly SAND, dense to very dense -interlayered Sand and Gravel below -Passing the # 200 sieve at 4.0m Fines=5.4%	GS	1-4	11					12
5		X	-some silt to silty below -Passing the # 200 sieve at 4.6m Fines=21.4%	GS	1-5						14
		X	-Passing the # 200 sieve at 4.9m Fines=15.2%	GS	1-6						16
		X	-without gravel below	GS	1-7						18
6			End of Test Hole at 5.2m								20

Sample Type: GS - Grab Sample    SPT - Standard Penetration Test  
 ST - Shelby Tube    PT - Piston Tube    CC - Continuous Core  
 Piezometer  
 Backfill Type:  Bentonite     Sloughed     Drill Cuttings     Sand

Logged by: KT/RI  
 Reviewed by: KT/WQ  
 Date: Jan 6, 2014





# BOREHOLE RECORD

**TH13-2** cont'd

CLIENT PUBLIC WORKS AND GOVERNMENT SERVICES CANADA PROJECT No. 123311089  
 PROJECT Geotechnical Assessment DATUM \_\_\_\_\_ NORTHING \_\_\_\_\_  
 LOCATION Stewart Port of Entry, Stewart, BC ELEVATION \_\_\_\_\_ EASTING \_\_\_\_\_  
 DRILLING DATE Dec 20, 2013 DRILLING CO. Downrite Drilling Co. DRILLING METHOD Solid Stem Auger

DEPTH (m)	USC	SOIL SYMBOL	SOIL DESCRIPTION	SAMPLES			<input type="checkbox"/> Insitu Shear Vane (kPa) <input type="checkbox"/> Remoulded Shear Vane (kPa) <input type="checkbox"/> Pocket Penetrometer (kPa) <input checked="" type="checkbox"/> Disturbed Torvane (kPa)				DEPTH (ft)
				TYPE	NUMBER	MOISTURE CONTENT (%)	50kPa	100kPa	150kPa	200kPa	
7		GP	Grey GRAVEL, some sand, trace cobbles and silt, compact to dense	X	GS2-10						20
8				X	GS2-11						26
9			End of Test Hole at 9.1m								30
10											34
11											36
12											40

Sample Type: GS - Grab Sample    SPT - Standard Penetration Test  
 ST - Shelby Tube    PT - Piston Tube    CC - Continuous Core  
 Piezometer Backfill Type:  Bentonite     Sloughed     Drill Cuttings     Sand

Logged by: KT/RI  
 Reviewed by: KT/WQ  
 Date: Jan 6, 2014



# BOREHOLE RECORD

## TH13-3

CLIENT PUBLIC WORKS AND GOVERNMENT SERVICES CANADA PROJECT No. 123311089  
 PROJECT Geotechnical Assessment DATUM \_\_\_\_\_ NORTHING \_\_\_\_\_  
 LOCATION Stewart Port of Entry, Stewart, BC ELEVATION \_\_\_\_\_ EASTING \_\_\_\_\_  
 DRILLING DATE Dec 20, 2013 DRILLING CO. Downrite Drilling Co. DRILLING METHOD Solid Stem Auger

DEPTH (m)	USC	SOIL SYMBOL	SOIL DESCRIPTION	SAMPLES		<input type="checkbox"/> Insitu Shear Vane (kPa) <input type="checkbox"/> Remoulded Shear Vane (kPa) <input type="checkbox"/> Pocket Penetrometer (kPa) <input checked="" type="checkbox"/> Disturbed Torvane (kPa)				DEPTH (ft)
				TYPE	NUMBER	MOISTURE CONTENT (%)	50kPa	100kPa	150kPa	
0			FILL - Blast Rock mixed with some silty sandy Gravel (till-fill)							0
0.5					3-1	10				2
1.5	FL		-without till fill		3-2					4
2.5			-brown below		3-3	10				6
3.5										8
4.0	CL		Grey clayey SILT, some organics and gravel, trace sand, firm to stiff		3-4	35				10
4.5										12
4.5	GM		Reddish brown GRAVEL, some sand and silt -Passing the # 200 sieve at 4.0m Fines=14.9%		3-5					14
5.0										16
5.0	GM		Grey silty SAND and GRAVEL, to some silt, compact -Passing the # 200 sieve at 4.3m Fines=19.5%		3-6	4				18
6.0			-less sand and silt with depth							20

Sample Type: GS - Grab Sample    SPT - Standard Penetration Test  
 ST - Shelby Tube    PT - Piston Tube    CC - Continuous Core  
 Piezometer Backfill Type:  Bentonite     Sloughed     Drill Cuttings     Sand

Logged by: KT/RI  
 Reviewed by: KT/WQ  
 Date: Jan 6, 2014



# BOREHOLE RECORD

**TH13-3** cont'd

CLIENT PUBLIC WORKS AND GOVERNMENT SERVICES CANADA PROJECT No. 123311089  
 PROJECT Geotechnical Assessment DATUM \_\_\_\_\_ NORTHING \_\_\_\_\_  
 LOCATION Stewart Port of Entry, Stewart, BC ELEVATION \_\_\_\_\_ EASTING \_\_\_\_\_  
 DRILLING DATE Dec 20, 2013 DRILLING CO. Downrite Drilling Co. DRILLING METHOD Solid Stem Auger

DEPTH (m)	USC	SOIL SYMBOL	SOIL DESCRIPTION	SAMPLES			TESTS				DEPTH (ft)
				TYPE	NUMBER	MOISTURE CONTENT (%)	□	□	△	×	
7		GP	Grey GRAVEL, some sand, trace cobbles and silt, compact to dense		3-7						20
8					3-8						26
9			End of Test Hole at 9.1m								30
10											34
11											36
12											38

Sample Type: GS - Grab Sample SPT - Standard Penetration Test  
 ST - Shelby Tube PT - Piston Tube CC - Continuous Core  
 Piezometer Backfill Type:  Bentonite  Sloughed  Drill Cuttings  Sand

Logged by: KT/RI  
 Reviewed by: KT/WQ  
 Date: Jan 6, 2014



Stewart Port of Entry Redevelopment  
Project # R.071365.001

## APPENDIX C – BARRIER GATE SPECIFICATION



# **TECHNICAL SPECIFICATIONS for Barrier Gate Operator for Barrier Arms With Smart Touch Controller**

## **PART I – GENERAL**

### **1.01. INCLUDED IN THIS SECTION**

- A. Pre-wired, barrier arm gate operator, complete with all pumps, valves, cylinders and electrical devices to move gate arm and limit its travel in both directions.

### **1.02. SUBMITTALS**

- A. Shop drawings: Submit shop drawings showing connections to adjacent construction, range of travel, and all electrical and mechanical connections to the operator. Drawings shall also show the size and location of the concrete mounting pad. Underground electrical runs shall be shown on shop drawings.
- B. Installation instructions: Submit two copies of manufacturer's installation instructions for this specific project.
- C. Test reports:
  - 1) Submit affidavits from the manufacturer demonstrating that the gate mechanism has been tested to 200,000 cycles without breakdown.
  - 2) Each operator shall bear a label indicating that the operator mechanism has been tested. Operator is tested for full power and pressure of all hydraulic components, full stress tests of all mechanical components and electrical tests of all overload devices.

### **1.03. QUALITY ASSURANCE**

- A. Manufacturer: A company specializing in the manufacture of hydraulic gate operators of the type specified, with a minimum of ten years experience.

### **1.04. CODES AND REGULATORY REQUIREMENTS**

- A. Operators shall be built to UL 325 standards and be listed by a testing laboratory. Complete all electrical work according to local codes and National Electrical code. All fieldwork shall be performed in a neat and professional manner, completed to journeyman standards.
- B. Current safety standards require gate operators to be designed and labeled for specific usage classes.

### **1.05. PRODUCT DELIVERY AND STORAGE**

- A. Store products upright in the original shipping containers, covered, ventilated and protected from all weather conditions.

## **PART II – PRODUCTS**

### **2.01. ACCEPTABLE PRODUCT**

Acceptable product is HySecurity StrongArm 20

### **2.02. OPERATION**

- A. Operation shall be by means of a hydraulic cylinder pulling a crank arm that rotates the output through ninety degrees. The arm travel time varies, depending upon version ordered, see schedule below. The body and chassis of the operator shall be made of 10-gauge (3.4 mm) steel; the cover shall be 14-gauge (2.11 mm) steel, to allow operation in strong winds without twisting of operator. Operation to the fully open and fully closed position shall be limited by cam operated switches that accurately read the position of the shaft and arm. Spring counterbalance shall not be required. Gears, sprockets, or belts shall not be incorporated in the operator. The standard finish of the chassis and cover of the operator shall be Safety Yellow. All models include two brake valves to gradually stop and hold the arm without applying a shock load to the arm or operator assembly. Manual operation, in case of power failure, shall be accomplished by the use of a "pull to release" bypass valve which unlocks the operator and allows the arm to be moved by hand.
- B. Schedule of capacities:

- 1) Travel time not to exceed three seconds from fully closed to fully open position. Maximum arm length shall be up to 20' (6.10 m) for 5" (127 mm) tubular designs.
- C. Standard components shall include as a minimum:
- 1) Chassis: shall be 10 gauge (3.4 mm) zinc plated steel, welded, and edges ground smooth.
  - 2) Cover: shall be 14 gauge (2.11 mm) zinc plated steel, with all joints welded, filled and ground smooth.
  - 3) Output shaft: shall be 1-1/4" (31.75 mm) diameter, high strength steel alloy.
  - 4) Crank arm: shall be made of 3/4" (19 mm) plate steel.
  - 5) Heavy duty sealed 1-1/4" (31.75 mm) bearings, with 4 bolt mounting flanges.
  - 6) Adjustable physical stop limiting close travel to prevent arm from sagging below a level position.
  - 7) Counterweights: shall be used for any arm 20 feet (6.10 m) and longer and utilize a yoke assembly to evenly distribute load.
  - 8) Hydraulic hose: shall be 1/4" (6.35 mm) synthetic, rated to 2750 PSI (19 MPa).
  - 9) Arm striping: shall be reflectorized alternating vertical red and white stripes 16" (406 mm) in width.
  - 10) Finish: Textured TGIC polyester powder coat finish in Safety Yellow, proven to withstand 1000-hour salt spray test.
- D. Minimum standard electrical components:
- 1) Pump motor: 3/4 HP minimum. 56C, TEFC, continuous duty, single or three phase available.
  - 2) Motor: shall have internal overload protection.
  - 3) Electrical enclosure: shall be rated NEMA 1 and have a hinged door.
  - 4) Controls: Smart Touch Controller Board with 256K memory containing:
    - a) bi-directional traffic mode;
    - b) built in "warn before operate" system;
    - c) built in timer to close;
    - d) liquid crystal display for reporting of functions;
    - e) 26 programmable output relay options;
    - f) anti-tailgate mode;
    - g) built-in power surge/lightening strike protection;
    - h) menu configuration, event logging and system diagnostics easily accessible with a PC;
    - i) RS232 port for connection to laptop or other computer peripheral and RS485 connection of Master/Slave systems.
  - 5) Control circuit shall be 24 VDC.
  - 6) Control transformer shall be 75 VA minimum, with multiple primary taps.
  - 7) Limit switches shall be adjustable to control maximum travel.
- E. Optional control devices to be supplied: key switch, radio control, pushbuttons.
- F. Provide ten (10) remote hand held radio control devices operable up to 500m from the gate location..
- G. Other options to be included:
- 1) Heater with thermostat for cold or damp climates.
  - 2) Optional "Warn before operate buzzer"
  - 3) 2" (51 mm) x 5" (127 mm) single piece aluminum arm up to 24' (7.32 m)
  - 4) 2" (51 mm) x 5" (127 mm) combination aluminum and fiberglass arm up to 36' (914 mm)
  - 5) Low voltage lights for barrier arm and flasher.
  - 6) Mill finished stainless steel cover with hot dipped galvanized chassis for marine, caustic, or other extreme environments.
  - 7) Available voltage is 240 volt single phase.

### 2.03. FACTORY TESTING

- A. Fully assemble and test, at the factory, each gate operator to assure smooth operation, sequencing and electrical connection integrity. Apply physical loads to the operator to simulate field conditions. Tests shall simulate physical and electrical loads equal to the fully rated capacity of the operator components.
- B. Check all mechanical connections for tightness and alignment. Check all welds for completeness and continuity. Check welded corners and edges to assure they are square and straight.
- C. Inspect painted finish for completeness and gloss. Touch up imperfections prior to shipment.
- D. Check all hydraulic hoses and electrical wires to assure that chafing cannot occur during shipping or operation.

## PART III – EXECUTION

**3.01. SITE EXAMINATION**

- A. Locate concrete mounting pad in accordance with approved shop drawings and in compliance with local building codes.

**3.02. INSTALLATION**

- A. Install gate operator in accordance with the manufacturer's printed instructions, current at the time of installation. Coordinate locations of operators with contract drawings, other trades and shop drawings.
- B. Installer shall insure that the electric service to the operator is at least 20 AMPS. Operator wattage is 1500.

**3.03. FIELD QUALITY CONTROL**

- A. Test gate operator through ten full cycles and adjust for operation without binding, scraping or uneven motion. Test limit switches for proper "at rest" gate position.
- B. All anchor bolts shall be fully concealed and fully tightened in the finished installation.
- C. Owner, or owner's representative, shall complete "punch list" with installing contractor prior to final acceptance of the installation and submit completed warranty documentation to manufacturer.

**3.04. CONTINUED SERVICE AND DOCUMENTATION**

- A. Train owner's personnel on how to safely shut off electrical power, release and manually operate barrier arm. Additionally, demonstrate the general maintenance of the gate operator and accessories and provide one copy of "Installation and Reference" manual for the owner's use (a second manual is available upon request). Manuals will identify parts of the equipment for future procurement. Direct maintenance personnel to HySecurity website, specifically the technical support sections.



Stewart Port of Entry Redevelopment  
Project # R.071365.001

## APPENDIX D – SIGNAGE REQUIREMENTS



# HH-40934A

## SINGLE-SIDED EXTERIOR SIGN

Installation:  Interior:  Exterior:

Electrical specifications:

Volts:  N/A Amp.:  N/A Circ.:  N/A

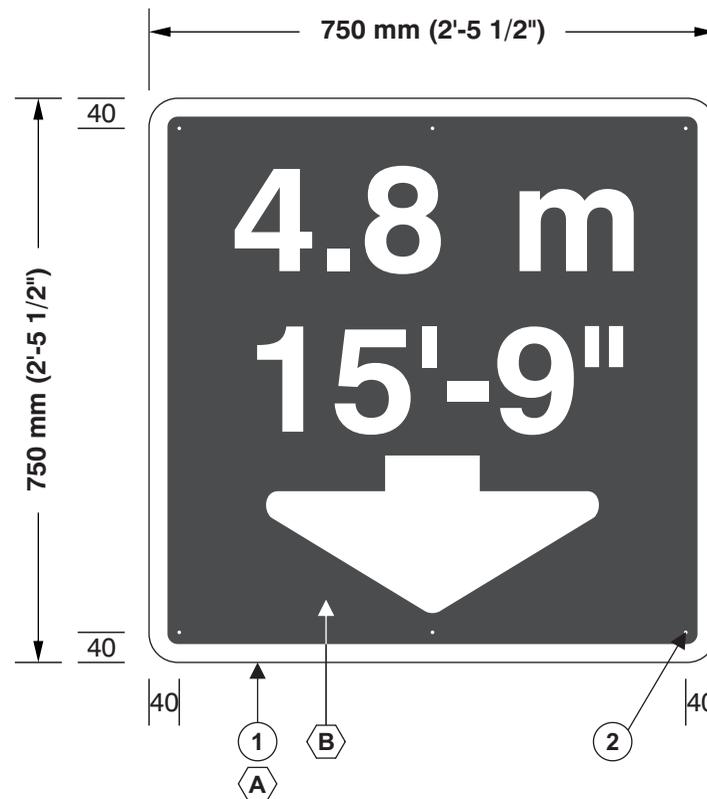
#	Descriptions:
1	.125 ALUMINUM
2	3/16" HOLES

**1x**

- Notes:**
- SINGLE-SIDED
  - WHITE TEXT AND ARROW PULLED OUT OF FIP DARK GREY VINYL
  - SURFACE MOUNTED WITH SCREWS
  - SCREWS PAINTED FIP DARK GREY (#501-200)
  - 1 1/2" RADIUS CORNERS
  - X-HEIGHT = 106 MM

#	Colors:
A	WHITE REFLECTIVE VINYL 3M #3290
B	FIP DARK GREY OPAQUE VINYL 3M #7725-0177

#	Revision(s)	By:	Date:
1	REVISED CLEARANCE	DD	05.19.2015



VIEWING DISTANCE = 60 M

### PRODUCTION INFORMATION : XX

XX	Plate #:
XX	XX

This sign is intended to be installed in accordance with the requirements of Article 600 of the National Electrical Code and/or other applicable local codes. This includes proper grounding and bonding of the sign.

Pattison Sign Group illuminated signs contain Fluorescent, Neon and/or HID Lamps. These lamps contain Mercury (Hg). Dispose of these lamps according to Local, Provincial, State, or Federal Laws.

IF THIS AGREEMENT INCLUDES THE MANUFACTURING AND INSTALLATION OF A BASE(S) BY PATTISON SIGN GROUP FOR THE SIGNS ORDERED HEREIN, SUCH BASE(S) SHALL BE BUILT AND INSTALLED IN ACCORDANCE WITH APPLICABLE LAWS AND REGULATIONS. IF A BASE(S) IS TO BE BUILT OR PROVIDED BY THE CUSTOMER (OR HIS AGENT), AND NOT BY PATTISON SIGN GROUP, THE CUSTOMER SHALL ENSURE THAT THE BASE(S) ARE BUILT AND INSTALLED IN ACCORDANCE WITH APPLICABLE LAWS AND REGULATIONS AND SHALL HOLD PATTISON SIGN GROUP HARMLESS AND INDEMNIFY IT AGAINST ANY AND ALL CLAIMS, LIABILITIES, ACTIONS, PENALTIES, FINES, AND ANY LEGAL FEES INCURRED BY PATTISON SIGN GROUP ARISING FROM THE FAILURE OF THE CUSTOMER (AND/OR IT'S AGENT) IN DOING SO.

### CUSTOMER APPROVAL

PRIOR TO SIGNING APPROVAL, PLEASE ENSURE THAT ALL MEASUREMENTS, DESIGN SPECIFICATIONS, SPELLING AND COLORS HAVE BEEN VERIFIED.

UPON SIGNING OF APPROVAL, THE CLIENT IS ENTIRELY RESPONSIBLE FOR COMPLETE PAYMENT OF GOODS.

CUSTOMER APPROVAL :

DATE: \_\_\_\_\_



Tel (613) 247-7762 · Fax (613) 247-7763 · Toll Free 1-800-661-2493

Client:	PWGSC		
Site:	VANCOUVER, BC		
Draftsman:	DANIEL DUROCHER	Date:	02.10.2015
Checked By:	XX		
Page:	1/1	Scale:	1:10

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www.pattisonsign.com

# HH-40934-2A

## SINGLE-SIDED EXTERIOR SIGN

Installation:	<input type="checkbox"/> Interior:	<input checked="" type="checkbox"/> Exterior:	
Electrical specifications:			
Volts:	<input type="checkbox"/> N/A	Amp.: <input type="checkbox"/> N/A	Circ.: <input type="checkbox"/> N/A
#	Descriptions:		
1	.125 ALUMINUM		
2	7/16" HOLES		
3	OMEGA POSTS (4'-0" & 8'-0" SECTIONS)		

**1x**

Notes:	
-	SINGLE-SIDED
-	WHITE TEXT AND ARROW PULLED OUT OF FIP DARK GREY VINYL
-	INSTALLED ON NEW OMEGA POST
-	EPSC TO SUPPLY HARDWARE
-	1 1/2" RADIUS CORNERS
-	X-HEIGHT = 75 MM

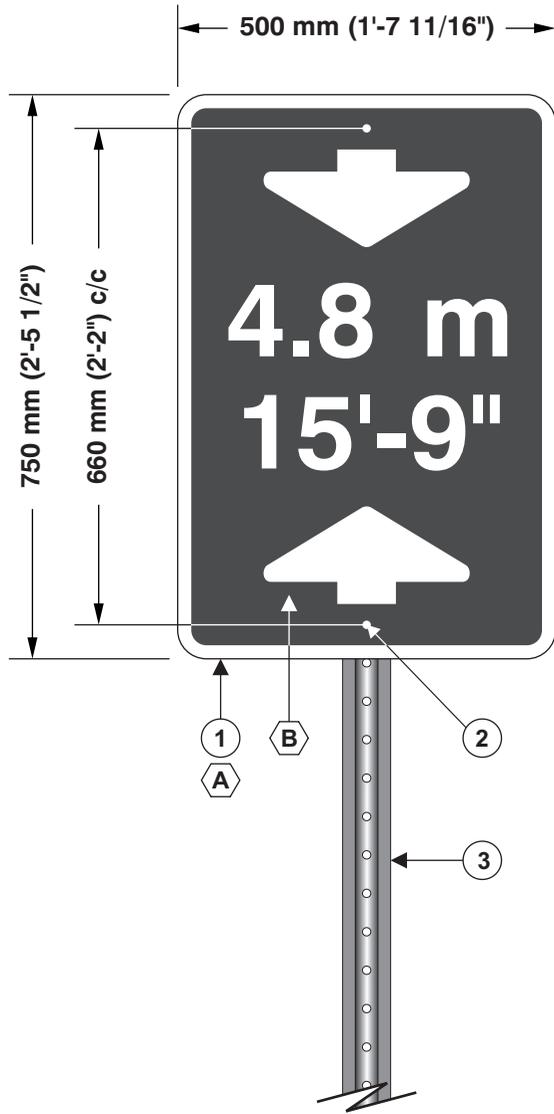
#	Colors:
A	WHITE REFLECTIVE VINYL 3M #3290
B	FIP DARK GREY OPAQUE VINYL 3M #7725-0177

#	Revision(s)	By:	Date:
1	REVISED HEIGHT	DD	03.24.2015
2	REVISED CLEARANCE	DD	05.19.2015

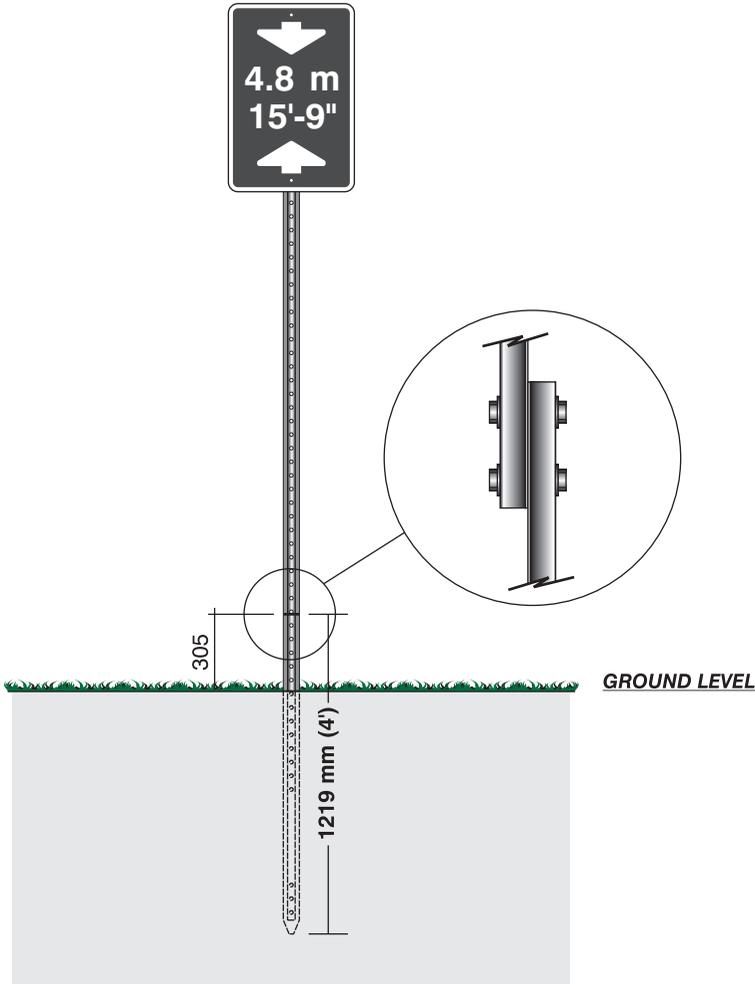


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Client:	PWGSC		
Site:	VANCOUVER, BC		
Draftsman:	DANIEL DUROCHER	Date:	02.12.2015
Checked By:	XX		
Page:	1/1	Scale:	1:10



VIEWING DISTANCE = 45 M



**PRODUCTION INFORMATION : XX**

XX	Descriptions:	Plate #:
XX	XX	XX

This sign is intended to be installed in accordance with the requirements of Article 600 of the National Electrical Code and/or other applicable local codes. This includes proper grounding and bonding of the sign.

Pattison Sign Group illuminated signs contain Fluorescent, Neon and/or HID Lamps. These lamps contain Mercury (Hg). Dispose of these lamps according to Local, Provincial, State, or Federal Laws.

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**CUSTOMER APPROVAL**

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UPON SIGNING OF APPROVAL, THE CLIENT IS ENTIRELY RESPONSIBLE FOR COMPLETE PAYMENT OF GOODS.

CUSTOMER APPROVAL :

DATE: \_\_\_\_\_

# HH-40934-3

## SINGLE-SIDED EXTERIOR SIGN

Installation:  Interior:  Exterior:

Electrical specifications:

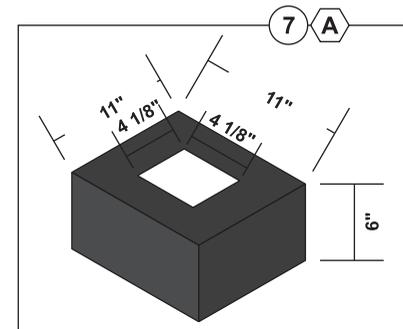
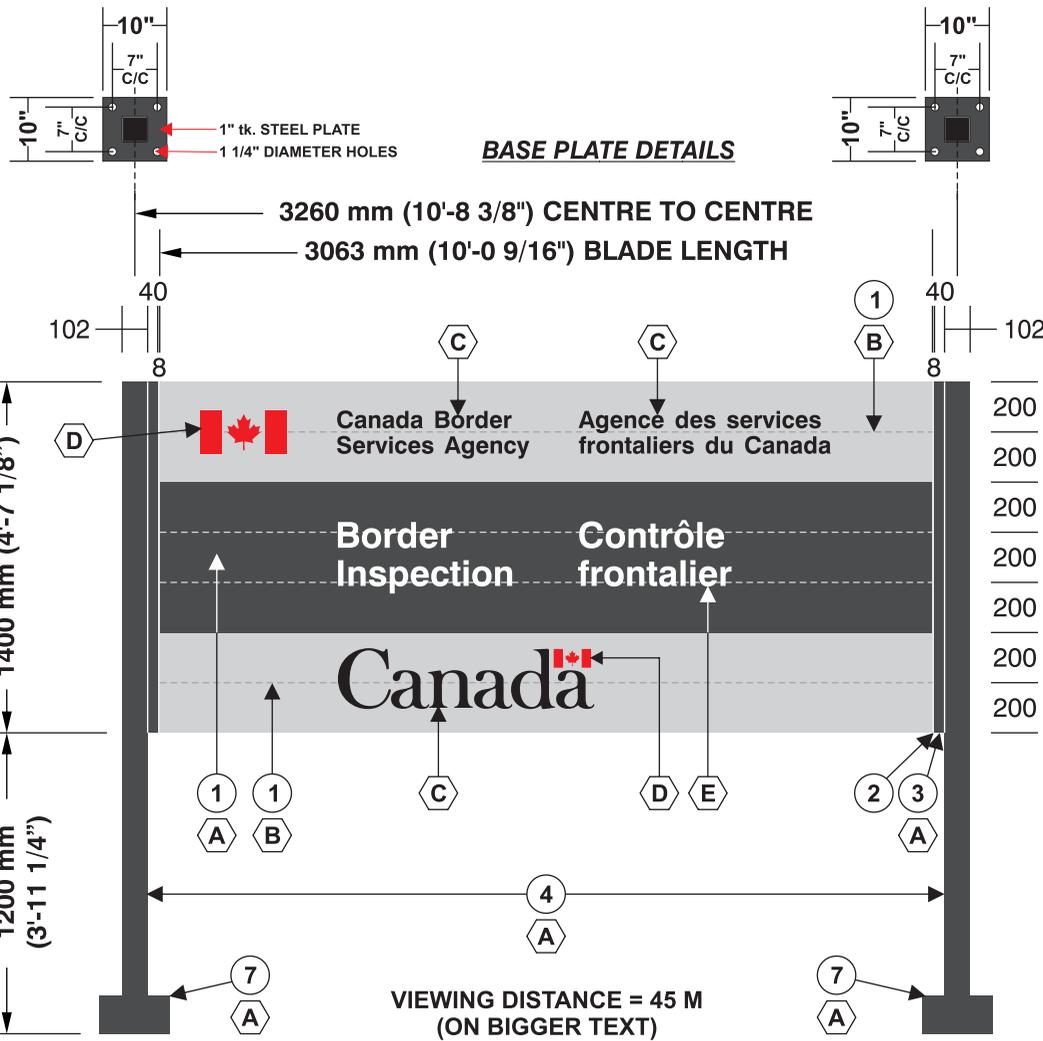
Volts:  Amp.:  Circ.:

#	Descriptions:
1	EXTRUDED ALUMINUM THICK BLADE
2	BLADE-END CONNECTORS IMN-76745
3	COLUMN RAILS IMN-76746
4	4" X 4" X 1/4" HSS POSTS (A500)
5	IMN-76755 (200C)
6	IMN-76754 (200A)
7	24 GA. METAL BASE COVERS

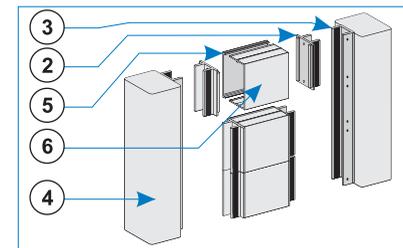
### Notes:

- SINGLE-SIDED
- FREESTANDING ON NEW 4" X 4" POSTS AND NEW CONCRETE BASES
- X-HEIGHT = 50 MM & 75 MM

#	Colors:
A	PAINT - FIP DARK GREY (#501-200)
B	PAINT - FIP LIGHT GREY (#501-224)
C	BLACK OPAQUE VINYL 3M #7725-12
D	FIP RED OPAQUE VINYL 3M #7725-13
E	WHITE REFLECTIVE VINYL 3M #3290



CONCRETE BASE COVER DETAILS



SIDE VIEW

### PRODUCTION INFORMATION : XX

XX	Descriptions:	Plate #:
	This sign is intended to be installed in accordance with the requirements of Article 600 of the National Electrical Code and/or other applicable local codes. This includes proper grounding and bonding of the sign.	XX
	Pattison Sign Group illuminated signs contain Fluorescent, Neon and/or HID Lamps. These lamps contain Mercury (Hg). Dispose of these lamps according to Local, Provincial, State, or Federal Laws.	XX
		XX

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CUSTOMER APPROVAL : \_\_\_\_\_ DATE: \_\_\_\_\_



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Client:	PWGSC		
Site:	VANCOUVER, BC		
Draftsman:	DANIEL DUROCHER	Date:	03.09.2015
Checked By:	XX		
Page:	1/1	Scale:	1:30

# HH-40934-4

## SINGLE-SIDED EXTERIOR SIGN

Installation:  Interior:  Exterior:

Electrical specifications:

Volts:  N/A Amp.:  N/A Circ.:  N/A

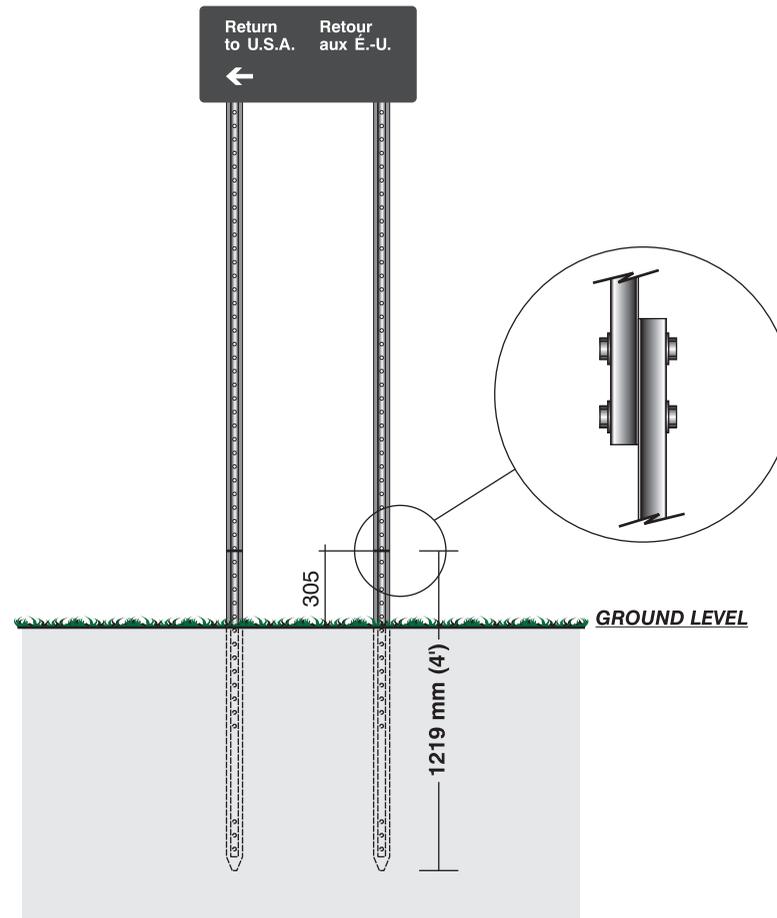
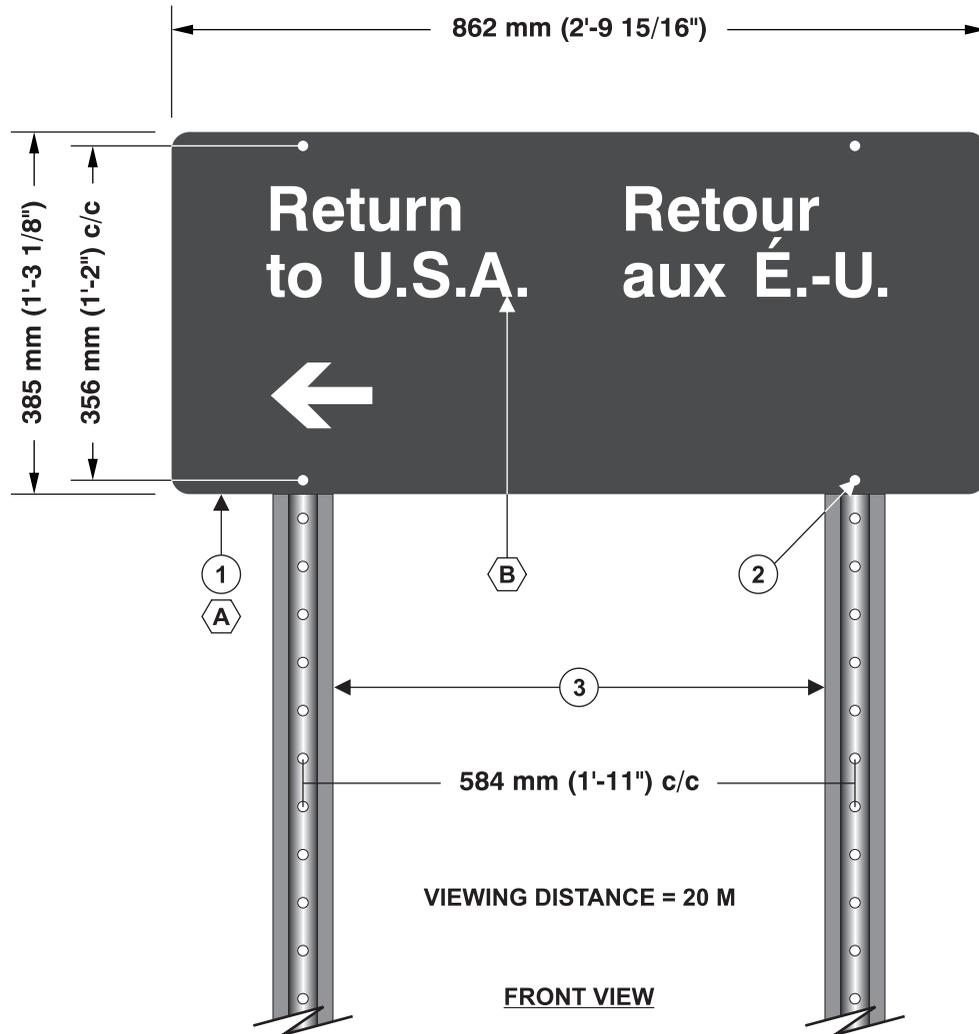
#	Descriptions:
1	.125 ALUMINUM
2	7/16" HOLES
3	OMEGA POSTS (4'-0" & 8'-0" SECTIONS)

**1x**

### Notes:

- SINGLE-SIDED
- INSTALLED ON NEW OMEGA POSTS
- EPSG TO SUPPLY HARDWARE
- 3/4" RADIUS CORNERS
- X-HEIGHT = 35 MM

#	Colors:
A	PAINT - FIP DARK GREY (#501-200)
B	WHITE REFLECTIVE VINYL 3M #3290



### PRODUCTION INFORMATION : XX

XX	Descriptions:	Plate #:
	XX	XX

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### CUSTOMER APPROVAL

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UPON SIGNING OF APPROVAL, THE CLIENT IS ENTIRELY RESPONSIBLE FOR COMPLETE PAYMENT OF GOODS.

CUSTOMER APPROVAL :

DATE: \_\_\_\_\_



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Client:	PWGSC		
Site:	VANCOUVER, BC		
Draftsman:	DANIEL DUROCHER	Date:	03.09.2015
Checked By:	XX		
Page:	1/1	Scale:	1:8

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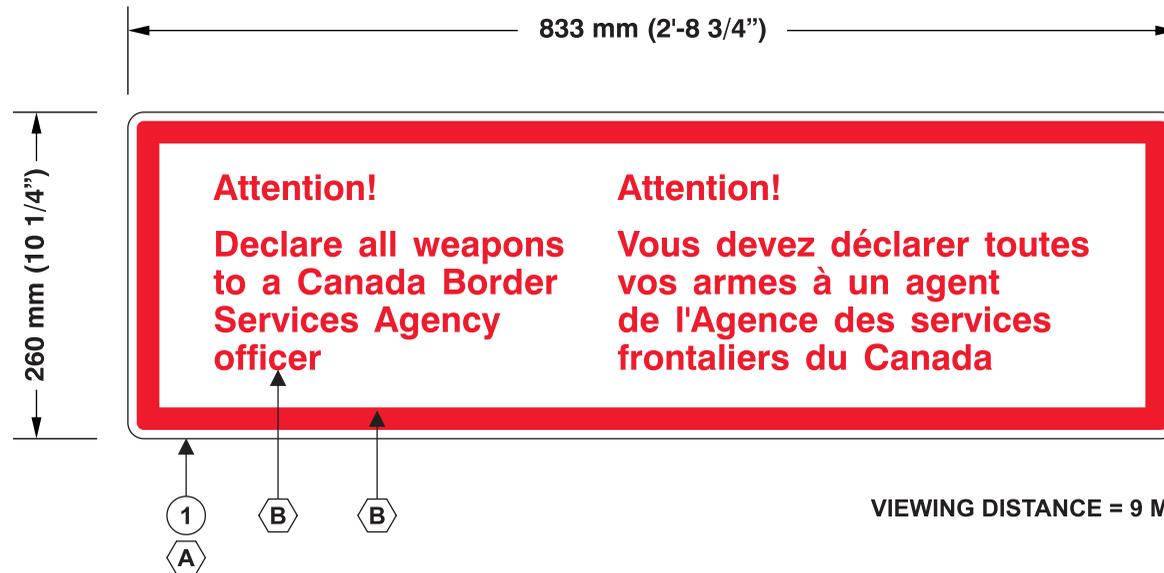
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# HH-40934-5A

## SINGLE-SIDED EXTERIOR SIGNS

Installation:	<input type="checkbox"/> Interior:	<input checked="" type="checkbox"/> Exterior:	
Electrical specifications:			
Volts:	<input type="checkbox"/> N/A	Amp.: <input type="checkbox"/> N/A	Circ.: <input type="checkbox"/> N/A
#	Descriptions:		
1	.125 ALUMINUM		

**2x**



Notes:	
-	SINGLE-SIDED
-	HOLES TO BE DONE ON-SITE
-	1/2" RADIUS CORNERS
-	X-HEIGHT = 15 MM

#	Colors:
A	WHITE REFLECTIVE VINYL 3M #3290
B	FIP RED OPAQUE VINYL 3M #7725-13

#	Revision(s)	By:	Date:
1	QUANTITY	DD	04.10.2015

### PRODUCTION INFORMATION : XX

XX	Descriptions:	Plate #:
XX	XX	XX

This sign is intended to be installed in accordance with the requirements of Article 600 of the National Electrical Code and/or other applicable local codes. This includes proper grounding and bonding of the sign.

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CUSTOMER APPROVAL :

DATE: \_\_\_\_\_

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Client:	PWGSC		
Site:	VANCOUVER, BC		
Draftsman:	DANIEL DUROCHER	Date:	03.09.2015
Checked By:	XX		
Page:	1/1	Scale:	1:6

# HH-40934-6

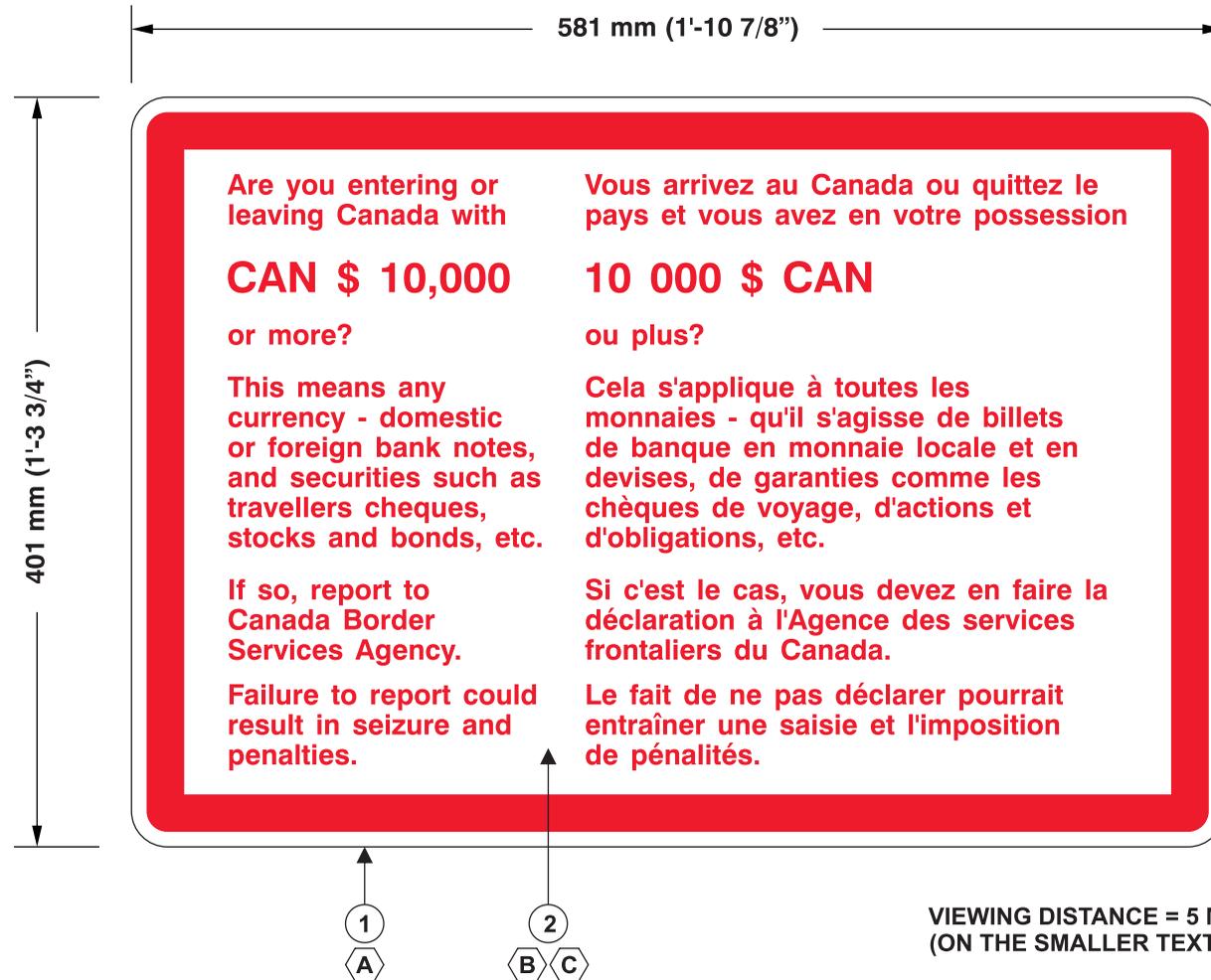
## SINGLE-SIDED EXTERIOR SIGN

Installation:	<input type="checkbox"/> Interior:	<input checked="" type="checkbox"/> Exterior:	
Electrical specifications:			
Volts:	<input type="checkbox"/> N/A	Amp.: <input type="checkbox"/> N/A	Circ.: <input type="checkbox"/> N/A
#	Descriptions:		
1	.125 ALUMINUM		
2	DIGITAL PRINT INSTALLED FIRST SURFACE ON ALUMINUM		

1x

Notes:
- SINGLE-SIDED
- HOLES TO BE DONE ON-SITE
- 3/4" RADIUS CORNERS
- X-HEIGHT = 8 MM & 12 MM

#	Colors:
A	WHITE REFLECTIVE VINYL 3M #3290
B	DIGITAL PRINT ON CLEAR VINYL #IJ3650-114
C	CLEAR PROTECTOR #8520



Are you entering or leaving Canada with

**CAN \$ 10,000**

or more?

This means any currency - domestic or foreign bank notes, and securities such as travellers cheques, stocks and bonds, etc.

If so, report to Canada Border Services Agency.

Failure to report could result in seizure and penalties.

Vous arrivez au Canada ou quittez le pays et vous avez en votre possession

**10 000 \$ CAN**

ou plus?

Cela s'applique à toutes les monnaies - qu'il s'agisse de billets de banque en monnaie locale et en devises, de garanties comme les chèques de voyage, d'actions et d'obligations, etc.

Si c'est le cas, vous devez en faire la déclaration à l'Agence des services frontaliers du Canada.

Le fait de ne pas déclarer pourrait entraîner une saisie et l'imposition de pénalités.

### PRODUCTION INFORMATION : XX

XX	Descriptions:	Plate #:
	XX	XX

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CUSTOMER APPROVAL :

DATE: \_\_\_\_\_



Tel (613) 247-7762 · Fax (613) 247-7763 · Toll Free 1-800-661-2493

Client:	PWGSC		
Site:	VANCOUVER, BC		
Draftsman:	DANIEL DUROCHER	Date:	03.09.2015
Checked By:	XX		
Page:	1/1	Scale:	1:4

# HH-40934-7

## SINGLE-SIDED EXTERIOR SIGN

Installation:  Interior:  Exterior:

Electrical specifications:

Volts:  N/A Amp.:  N/A Circ.:  N/A

#	Descriptions:
1	.125 ALUMINUM
2	DIGITAL PRINT INSTALLED FIRST SURFACE ON ALUMINUM

1x

### Notes:

- SINGLE-SIDED
- HOLES TO BE DONE ON-SITE
- 1 1/2" RADIUS CORNERS
- X-HEIGHT = 8 MM, 10 MM & 15 MM

#	Colors:
A	WHITE REFLECTIVE VINYL 3M #3290
B	DIGITAL PRINT ON CLEAR VINYL #IJ3650-114
C	CLEAR PROTECTOR #8520

1524 mm (5'-0")

965 mm (3'-2")

Travellers' Personal Exemptions	Exemptions personnelles des voyageurs																																
<p><b>Minimum Duty - Residents of Canada</b></p> <p>Residents of Canada must pay a minimum duty on certain tobacco products they include in their personal exemption. This duty does not apply if the products have an excise stamp "DUTY-PAID CANADA DROIT ACQUITTE". The duty rates are:</p> <table border="1" style="width: 100%; font-size: small;"> <tr> <td>Cigarettes</td> <td>CAN \$ 15.00</td> <td>Per carton of 200</td> </tr> <tr> <td>Tobacco Sticks</td> <td>CAN \$ 15.00</td> <td>Per carton of 200</td> </tr> <tr> <td>Manufactured Tobacco</td> <td>CAN \$ 10.00</td> <td>Per 200 grams</td> </tr> </table>	Cigarettes	CAN \$ 15.00	Per carton of 200	Tobacco Sticks	CAN \$ 15.00	Per carton of 200	Manufactured Tobacco	CAN \$ 10.00	Per 200 grams	<p><b>Droit minimal - Résidents du Canada</b></p> <p>Les résidents du Canada doivent payer un droit minimal sur certains produits du tabac qu'ils incluent dans leur exemption personnelle. Ce droit minimal ne s'applique pas si les produits portent un timbre d'accise «DUTY-PAID CANADA DROIT ACQUITTE». Les taux de droits de douanes sont :</p> <table border="1" style="width: 100%; font-size: small;"> <tr> <td>Cigarettes</td> <td>15,00 \$ CAN</td> <td>La cartouche de 200</td> </tr> <tr> <td>Bâtonnets de tabac</td> <td>15,00 \$ CAN</td> <td>La cartouche de 200</td> </tr> <tr> <td>Tabac fabriqué</td> <td>10,00 \$ CAN</td> <td>Par 200 grammes</td> </tr> </table>	Cigarettes	15,00 \$ CAN	La cartouche de 200	Bâtonnets de tabac	15,00 \$ CAN	La cartouche de 200	Tabac fabriqué	10,00 \$ CAN	Par 200 grammes														
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1

A

2

B

C

### PRODUCTION INFORMATION : XX

XX	Descriptions:	Plate #:
	XX	XX

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### CUSTOMER APPROVAL

PRIOR TO SIGNING APPROVAL, PLEASE ENSURE THAT ALL MEASUREMENTS, DESIGN SPECIFICATIONS, SPELLING AND COLORS HAVE BEEN VERIFIED.

UPON SIGNING OF APPROVAL, THE CLIENT IS ENTIRELY RESPONSIBLE FOR COMPLETE PAYMENT OF GOODS.

CUSTOMER APPROVAL :

DATE: \_\_\_\_\_

ISO 9001:2008 Certified Enterprise

www.pattisonsign.com

Tel (613) 247-7762 · Fax (613) 247-7763 · Toll Free 1-800-661-2493

Client:	PWGSC		
Site:	VANCOUVER, BC		
Draftsman:	DANIEL DUROCHER	Date:	03.09.2015
Checked By:	XX		
Page:	1/1	Scale:	1:10

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# HH-40934-8A

## DECAL

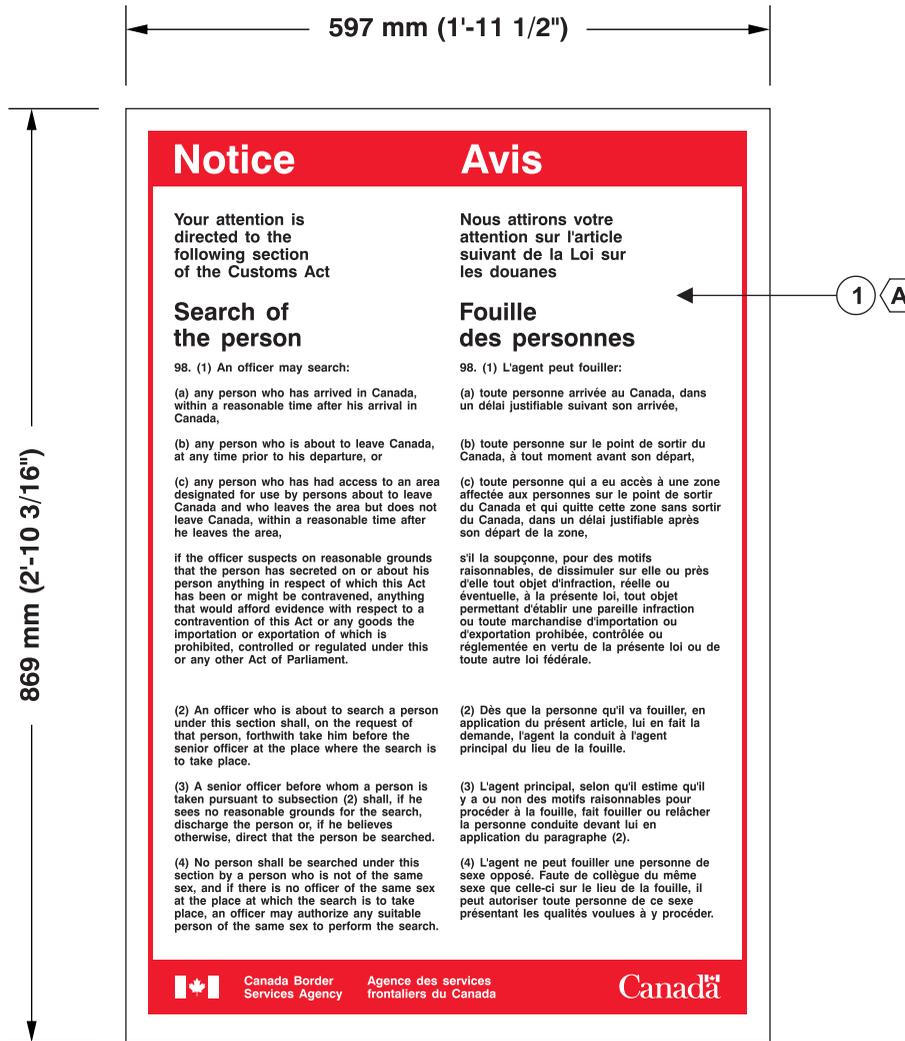
Installation:	<input checked="" type="checkbox"/> Interior:	<input type="checkbox"/> Exterior:			
Electrical specifications:					
Volts:	<input type="text" value="N/A"/>	Amp.:	<input type="text" value="N/A"/>	Circ.:	<input type="text" value="N/A"/>
#	Descriptions:				
1	DIGITAL PRINT INSTALLED FIRST SURFACE ON GLASS				

**1x**

<b>Notes:</b>
- SINGLE-SIDED
- SURFACE MOUNTED ON GLASS (1ST SURFACE)
- X-HEIGHT = 6 MM, 8 MM & 12 MM

#	Colors:
A	DIGITAL PRINT ON WHITE OPAQUE VINYL #IJ3650-10

#	Revision(s)	By:	Date:
1	REVISED	DD	04.10.2015



<b>PRODUCTION INFORMATION : XX</b>	
XX	Descriptions: Plate #:
XX	XX

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CUSTOMER APPROVAL : \_\_\_\_\_ DATE: \_\_\_\_\_

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# HH-40934-9A

## DECAL

Installation:  Interior:  Exterior:

Electrical specifications:

Volts:  Amp.:  Circ.:

#	Descriptions:
1	DIGITAL PRINT INSTALLED FIRST SURFACE ON GLASS

**1x**

Notes:
- SINGLE-SIDED - SURFACE MOUNTED ON GLASS (1ST SURFACE) - X-HEIGHT = 10 MM & 17 MM

#	Colors:
A	DIGITAL PRINT ON WHITE OPAQUE VINYL #IJ3650-10

#	Revision(s)	By:	Date:
1	REVISED	DD	04.10.2015



### PRODUCTION INFORMATION : XX

XX	Descriptions:	Plate #:
	XX	XX

This sign is intended to be installed in accordance with the requirements of Article 600 of the National Electrical Code and/or other applicable local codes. This includes proper grounding and bonding of the sign.

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CUSTOMER APPROVAL : \_\_\_\_\_ DATE: \_\_\_\_\_



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Site:	VANCOUVER, BC		
Draftsman:	DANIEL DUROCHER	Date:	03.09.2015
Checked By:	XX		
Page:	1/1	Scale:	1:4

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# HH-40934-10

## SINGLE-SIDED EXTERIOR SIGN

Installation:  Interior:  Exterior:

Electrical specifications:

Volts:  N/A Amp.:  N/A Circ.:  N/A

#	Descriptions:
1	.125 ALUMINUM

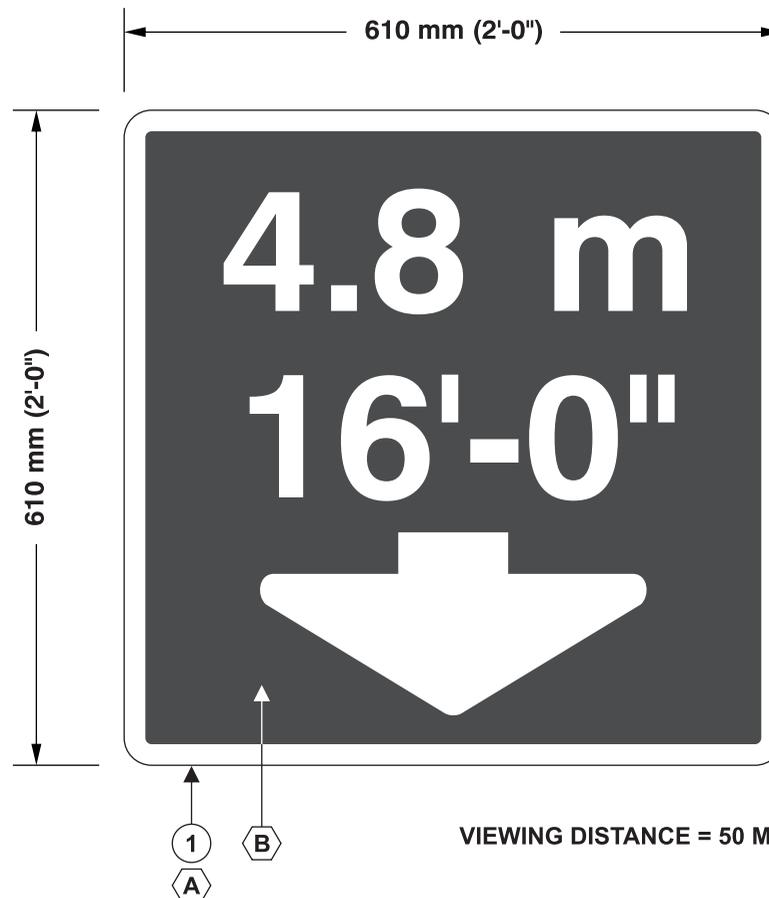
# 1x

### Notes:

- SINGLE-SIDED
- SURFACE MOUNTED ON CANOPY
- SCREWS PAINTED FIP DARK GREY (#501-200)
- HOLES TO BE DONE ON-SITE
- WHITE TEXT PULLED OUT OF FIP DARK GREY VINYL
- 1" RADIUS CORNERS
- X-HEIGHT = 86 MM

#	Colors:
A	WHITE REFLECTIVE VINYL 3M #3290
B	FIP DARK GREY OPAQUE VINYL 3M #7725-0177

#	Revision(s)	By:	Date:
1	REVISED HEIGHT	DD	03.24.2015



### PRODUCTION INFORMATION : XX

XX	Descriptions:	Plate #:
	XX	XX

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CUSTOMER APPROVAL :

DATE: \_\_\_\_\_

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Site:	VANCOUVER, BC		
Draftsman:	DANIEL DUROCHER	Date:	03.09.2015
Checked By:	XX		
Page:	1/1	Scale:	1:7

# HH-40934-11A

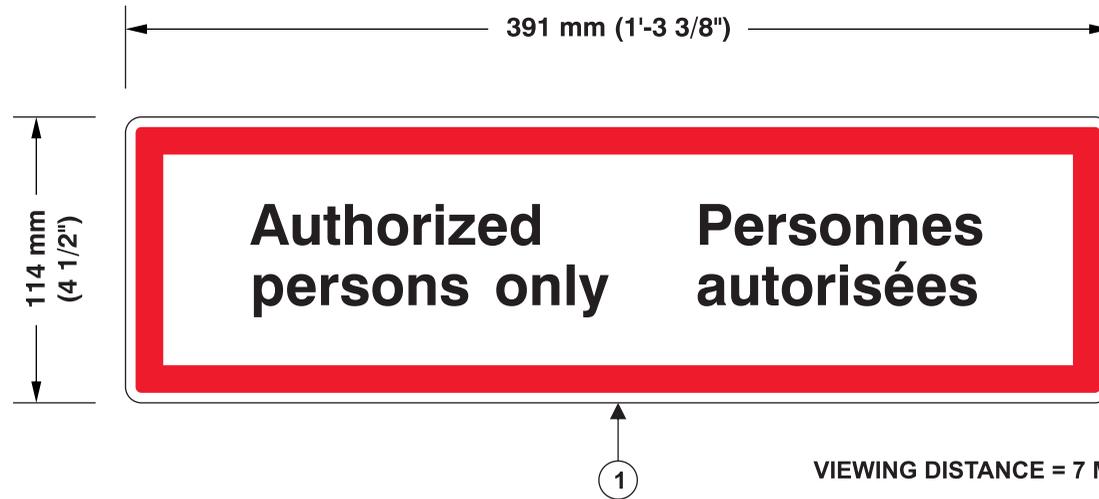
## SINGLE-SIDED EXTERIOR SIGNS

Installation:  Interior:  Exterior:

Electrical specifications:

Volts:  Amp.:  Circ.:

#	Descriptions:
1	STOCK ITEM - T 1E.1.3
*	EXTERIOR GRADE DOUBLE-FACE TAPE



**4x**

### Notes:

- SINGLE-SIDED
- SILKSCREENED
- .064 ALUMINUM
- SURFACE MOUNTED WITH EXTERIOR GRADE DOUBLE-FACE TAPE
- 1/4" RADIUS CORNERS
- X-HEIGHT = 12 MM

#	Revision(s)	By:	Date:
1	QUANTITY	DD	04.10.2015

### PRODUCTION INFORMATION : XX

XX	Descriptions:	Plate #:
	XX	XX

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CUSTOMER APPROVAL :

DATE: \_\_\_\_\_

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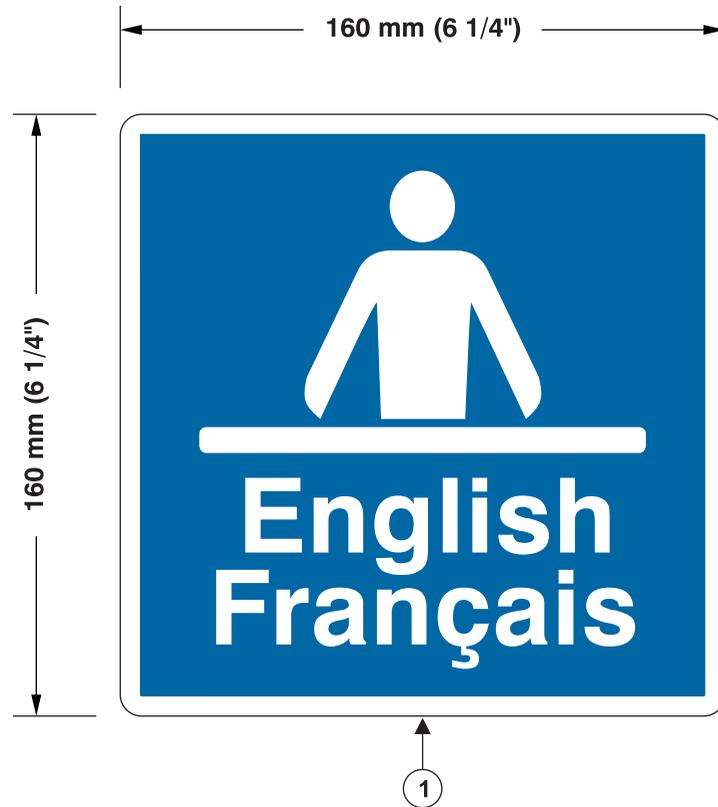
Tel (613) 247-7762 · Fax (613) 247-7763 · Toll Free 1-800-661-2493

Client:	PWGSC		
Site:	VANCOUVER, BC		
Draftsman:	DANIEL DUROCHER	Date:	03.09.2015
Checked By:	XX		
Page:	1/1	Scale:	1:3

# HH-40934-12A

## SINGLE-SIDED INTERIOR SIGNS

Installation:	<input checked="" type="checkbox"/> Interior:	<input type="checkbox"/> Exterior:			
Electrical specifications:					
Volts:	<input type="text" value="N/A"/>	Amp.:	<input type="text" value="N/A"/>	Circ.:	<input type="text" value="N/A"/>
#	Descriptions:				
1	STOCK ITEM - V.4 (ENGLISH) 160 MM X 160 MM				



**3X**

Notes:
<ul style="list-style-type: none"> <li>- SINGLE-SIDED</li> <li>- SILKSCREENED</li> <li>- .040 ALUMINUM</li> <li>- INSTALLED ON COUNTER</li> <li>- RADIUS CORNERS ON TOP</li> </ul>

#	Revision(s)	By:	Date:
1	QUANTITY	DD	04.10.2015

### PRODUCTION INFORMATION : XX

XX	Descriptions:	Plate #:
	XX	XX

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DATE: \_\_\_\_\_



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Client:	PWGSC		
Site:	VANCOUVER, BC		
Draftsman:	DANIEL DUROCHER	Date:	03.09.2015
Checked By:	XX		
Page:	1/1	Scale:	1:2

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# HH-40934-13

## SINGLE-SIDED EXTERIOR SIGN ON POST

Installation:  Interior:  Exterior:

Electrical specifications:

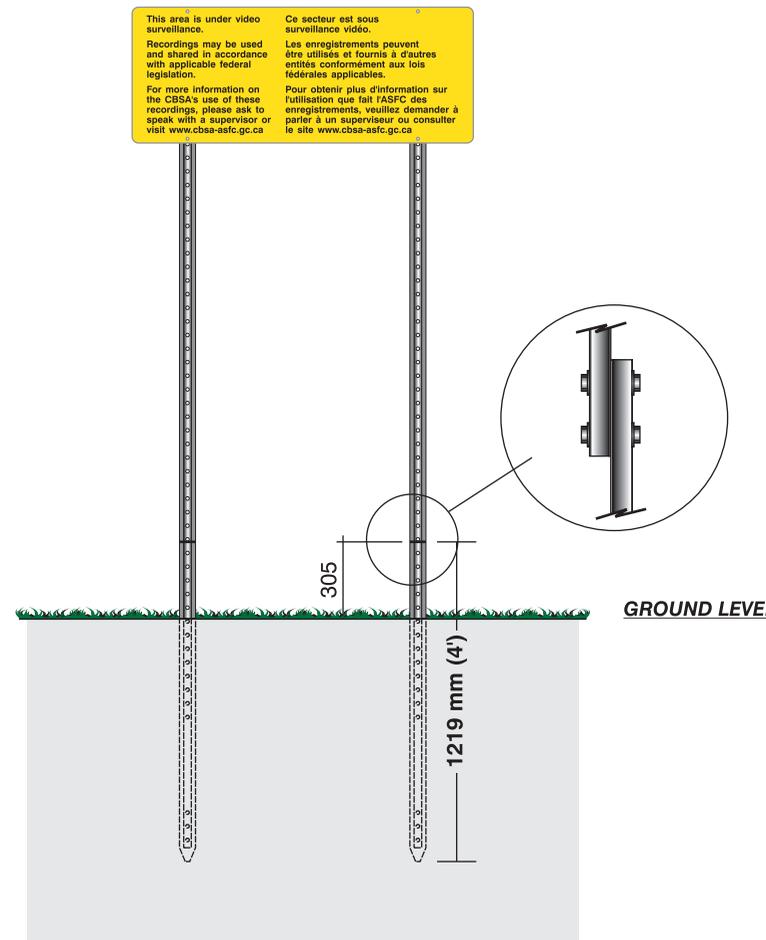
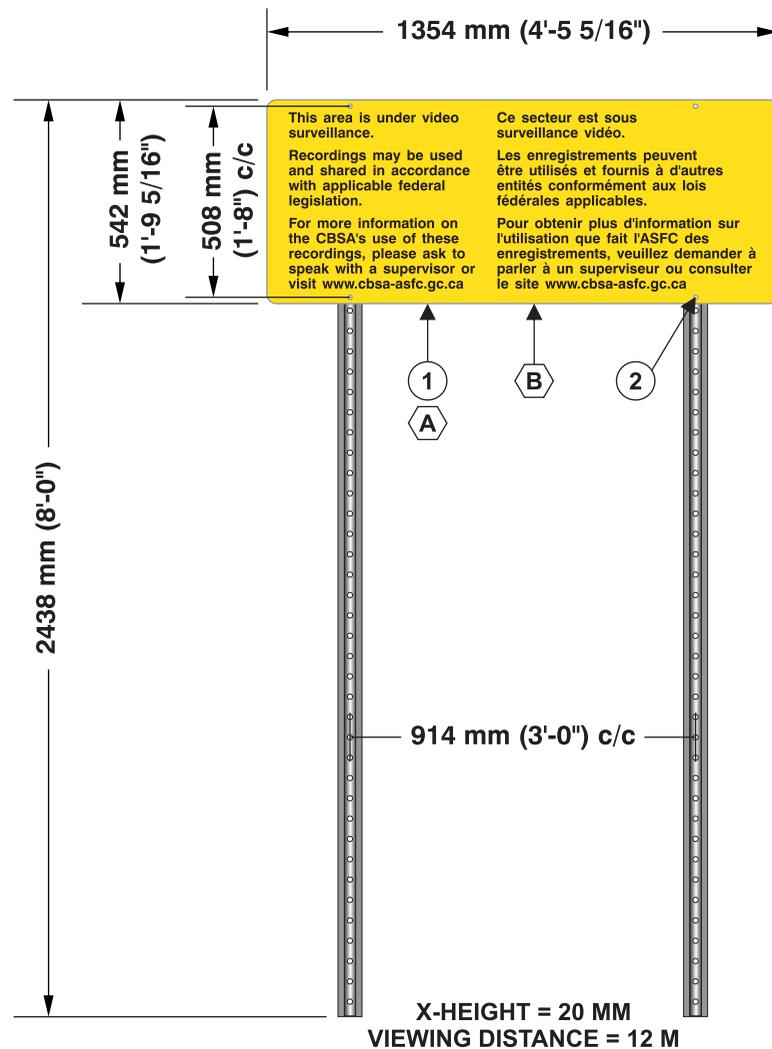
Volts:  Amp.:  Circ.:

#	Descriptions:
1	.125 ALUMINUM
2	7/16" HOLES
3	OMEGA POST (4'-0" & 8'-0" SECTIONS)

### Notes:

- SINGLE-SIDED
- INSTALLED ON OMEGA POST
- 1" RADIUS CORNERS

#	Colors:
A	 PAINT - FIP YELLOW (PMS 109C)
B	 BLACK OPAQUE VINYL 3M #7725-12



### PRODUCTION INFORMATION : XX

XX	Descriptions:	Plate #:
		
		
		
XX	XX	XX

This sign is intended to be installed in accordance with the requirements of Article 600 of the National Electrical Code and/or other applicable local codes. This includes proper grounding and bonding of the sign.

Pattison Sign Group illuminated signs contain Fluorescent, Neon and/or HID Lamps. These lamps contain Mercury (Hg). Dispose of these lamps according to Local, Provincial, State, or Federal Laws.

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### CUSTOMER APPROVAL

PRIOR TO SIGNING APPROVAL, PLEASE ENSURE THAT ALL MEASUREMENTS, DESIGN SPECIFICATIONS, SPELLING AND COLORS HAVE BEEN VERIFIED.

UPON SIGNING OF APPROVAL, THE CLIENT IS ENTIRELY RESPONSIBLE FOR COMPLETE PAYMENT OF GOODS.

CUSTOMER APPROVAL :

DATE: \_\_\_\_\_

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Draftsman:	DANIEL DUROCHER	Date:	03.09.2015
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# HH-40934-14

## STOP SIGN

Installation:  Interior:  Exterior:

Electrical specifications:

Volts:  N/A Amp.:  N/A Circ.:  N/A

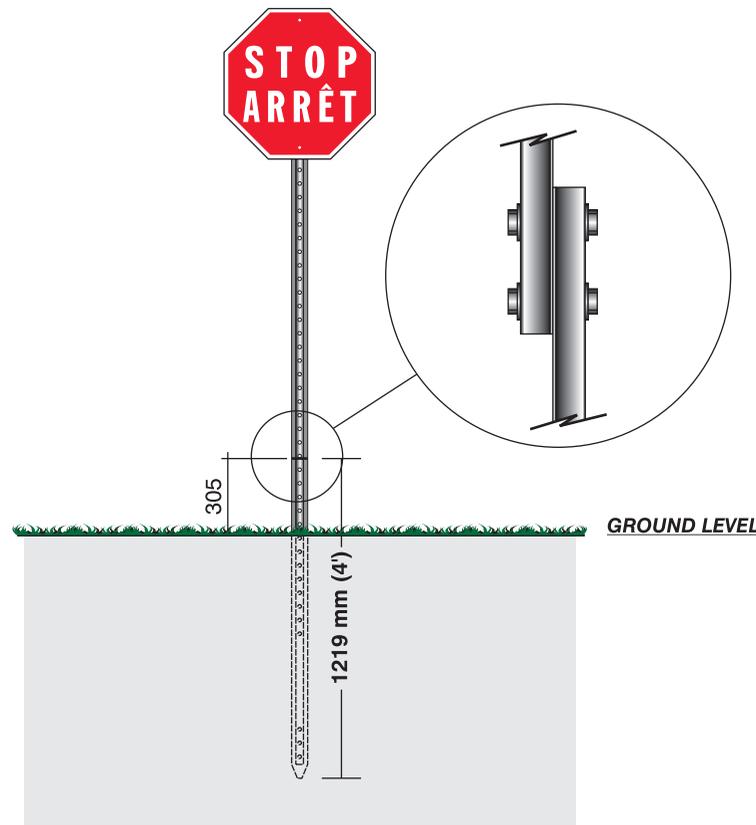
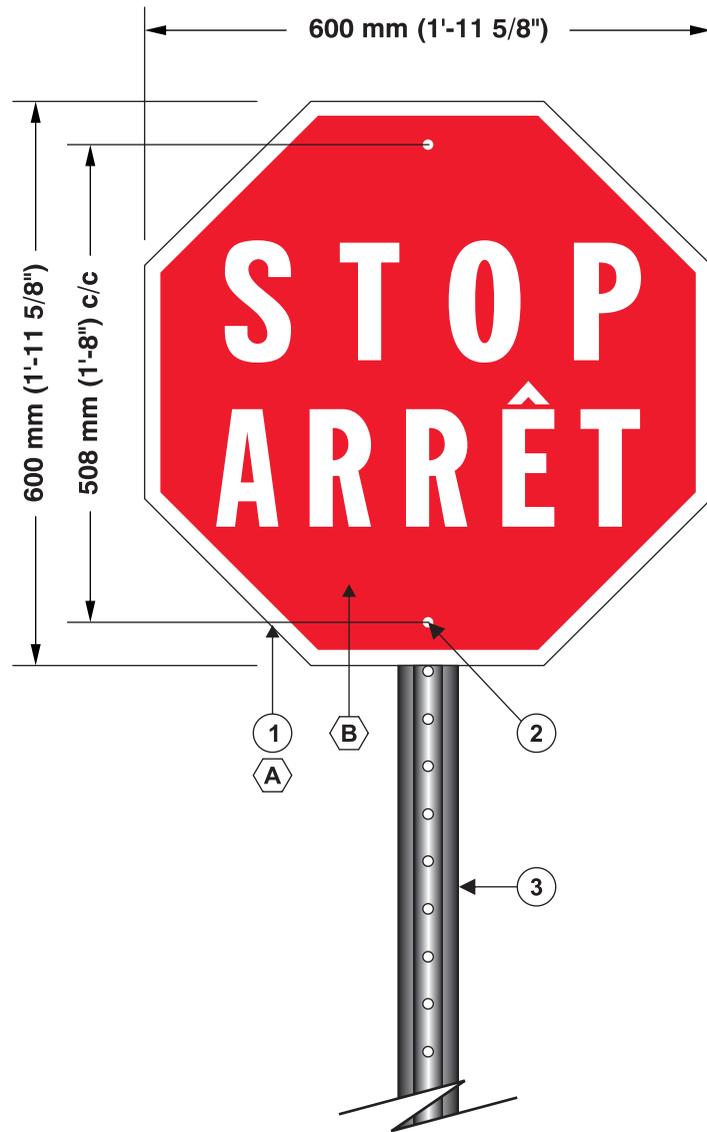
#	Descriptions:
1	.125 ALUMINUM
2	7/16" HOLES
3	OMEGA POST (4'-0" & 8'-0" SECTIONS)

**1x**

### Notes:

- SINGLE-SIDED
- .125 ALUMINUM
- INSTALLED ON NEW OMEGA POST
- EPSG TO PROVIDE HARDWARE

#	Colors:
A	WHITE REFLECTIVE VINYL 3M #3290
B	FIP RED OPAQUE VINYL 3M #7725-13



### PRODUCTION INFORMATION : XX

XX	Descriptions:	Plate #:
		XX

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CUSTOMER APPROVAL :

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Page:	1/1	Scale:	1:8

# HH-40934-15

## SINGLE-SIDED EXTERIOR SIGN

Installation:  Interior:  Exterior:

Electrical specifications:

Volts:  N/A Amp.:  N/A Circ.:  N/A

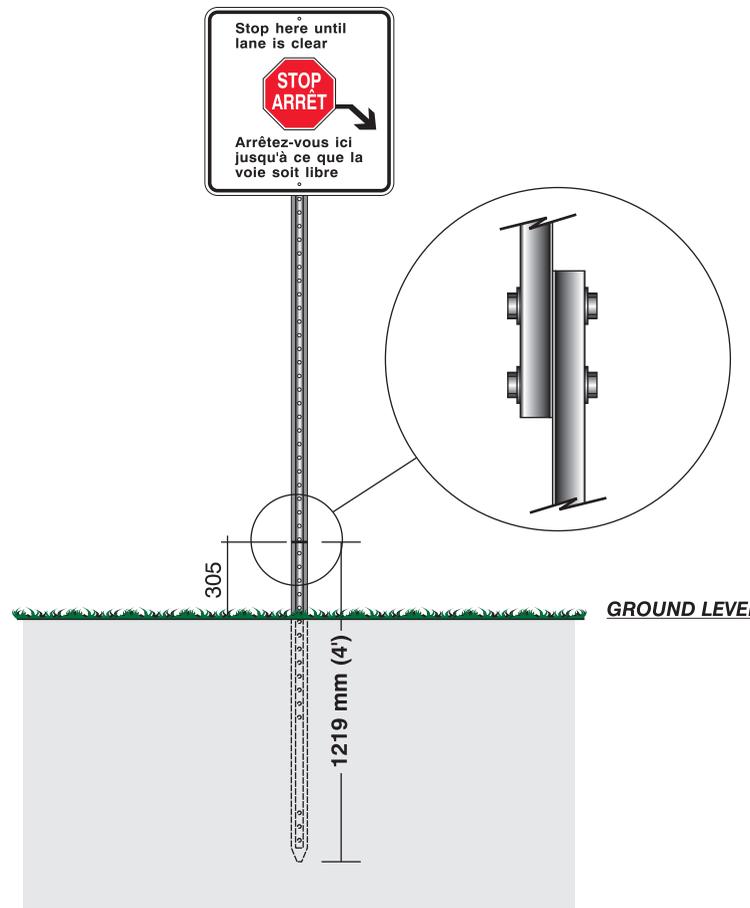
#	Descriptions:
1	.125 ALUMINUM
2	7/16" HOLES
3	OMEGA POST (4'-0" & 8'-0" SECTIONS)

**1x**

### Notes:

- SINGLE-SIDED
- WHITE TEXT PULLED OUT OF FIP RED VINYL
- INSTALLED ON NEW OMEGA POST
- 2" RADIUS CORNERS
- X-HEIGHT = 30 MM

#	Colors:
A	WHITE RETRO-REFLECTIVE VINYL 3M #3290
B	BLACK OPAQUE VINYL 3M #7725-12
C	FIP RED OPAQUE VINYL 3M #7725-13



VIEWING DISTANCE = 18 M

### PRODUCTION INFORMATION : XX

XX	Descriptions:	Plate #:
	XX	XX

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CUSTOMER APPROVAL :

DATE: \_\_\_\_\_

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Page:	1/1	Scale:	1:8

# HH-40394-16A

## PEDESTRIAN SIGNS

Installation:  Interior:  Exterior:

Electrical specifications:

Volts:  N/A Amp.:  N/A Circ.:  N/A

#	Descriptions:
1	.125 ALUMINUM
2	7/16" HOLES
3	OMEGA POST (4'-0" & 8'-0" SECTIONS)

**2x**

### Notes:

- SINGLE-SIDED
- EPSG TO SUPPLY HARDWARE
- 1 1/2" RADIUS CORNERS

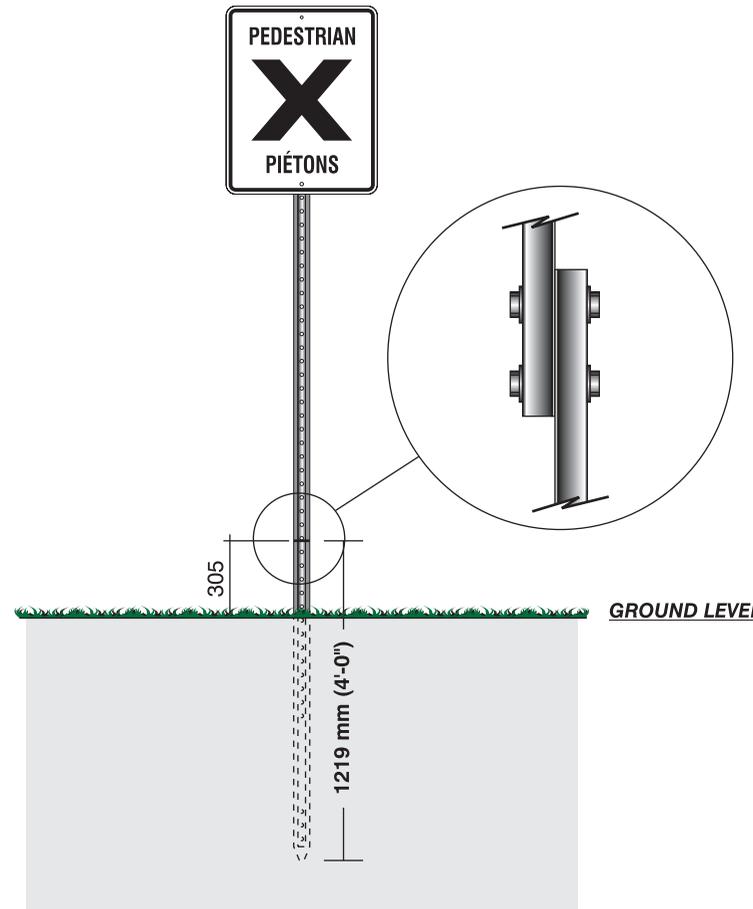
#	Colors:
A	WHITE REFLECTIVE VINYL 3M #3290
B	BLACK OPAQUE VINYL 3M #7725-12

#	Revision(s)	By:	Date:
1	QUANTITY	DD	04.10.2015



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Site:	VANCOUVER, BC		
Draftsman:	DANIEL DUROCHER	Date:	03.09.2015
Checked By:	XX		
Page:	1/1	Scale:	1:8



### PRODUCTION INFORMATION : XX

XX	Descriptions:	Plate #:
XX	XX	XX

This sign is intended to be installed in accordance with the requirements of Article 600 of the National Electrical Code and/or other applicable local codes. This includes proper grounding and bonding of the sign.

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CUSTOMER APPROVAL :

DATE: \_\_\_\_\_

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# HH-40934-17

## PARKING SIGN

Installation:  Interior:  Exterior:

Electrical specifications:

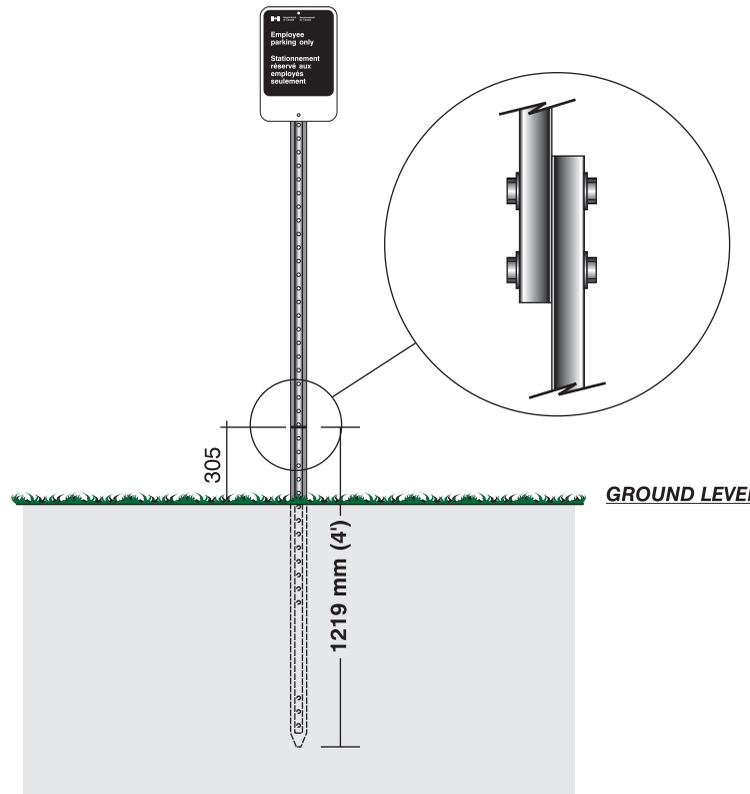
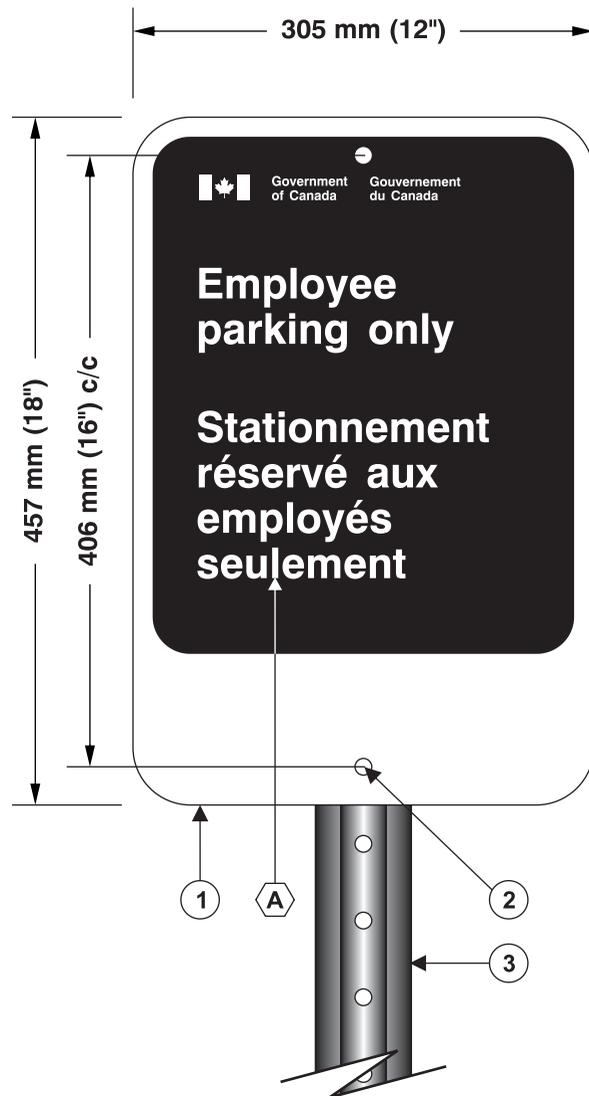
Volts:  Amp.:  Circ.:

#	Descriptions:
1	STOCK ITEM - T PE.6
2	7/16" HOLES
3	OMEGA POST (4'-0" & 8'-0" SECTIONS)

**1x**

Notes:
- SINGLE-SIDED
- .125 ALUMINUM
- INSTALLED ON NEW OMEGA POST
- EPSG TO PROVIDE HARDWARE
- 1 1/2" RADIUS CORNERS

#	Colors:
A	WHITE REFLECTIVE VINYL 3M #3290



### PRODUCTION INFORMATION : XX

XX	Descriptions:	Plate #:
XX	XX	XX

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CUSTOMER APPROVAL :

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Draftsman:	DANIEL DUROCHER	Date:	03.09.2015
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Page:	1/1	Scale:	1:5

# HH-40934-18

## PARKING SIGN

Installation:  Interior:  Exterior:

Electrical specifications:

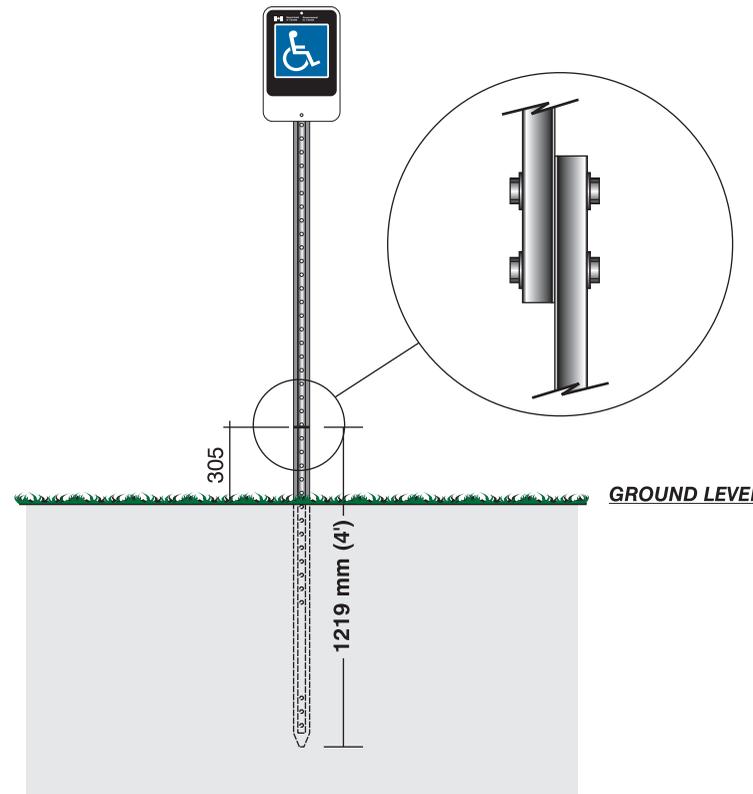
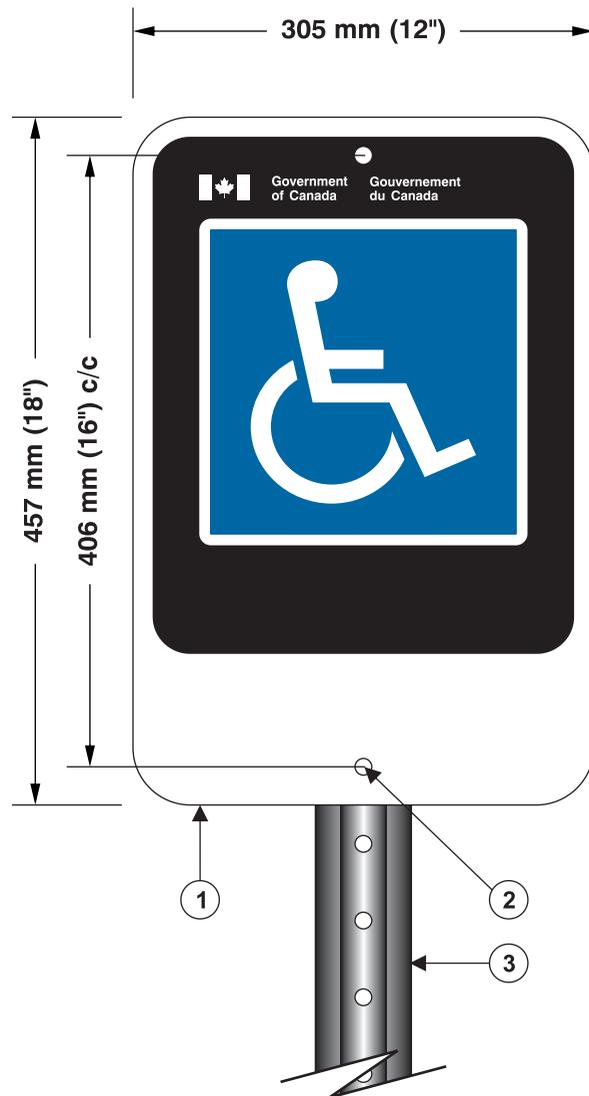
Volts:  N/A Amp.:  N/A Circ.:  N/A

#	Descriptions:
1	STOCK ITEM - T PE.3
2	7/16" HOLES
3	OMEGA POST (4'-0" & 8'-0" SECTIONS)

**1x**

### Notes:

- SINGLE-SIDED
- .125 ALUMINUM
- SILKSCREENED
- INSTALLED ON NEW OMEGA POST
- EPSG TO PROVIDE HARDWARE
- 1 1/2" RADIUS CORNERS



### PRODUCTION INFORMATION : XX

XX	Descriptions:	Plate #:
XX	XX	XX

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CUSTOMER APPROVAL :

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Draftsman:	DANIEL DUROCHER	Date:	03.09.2015
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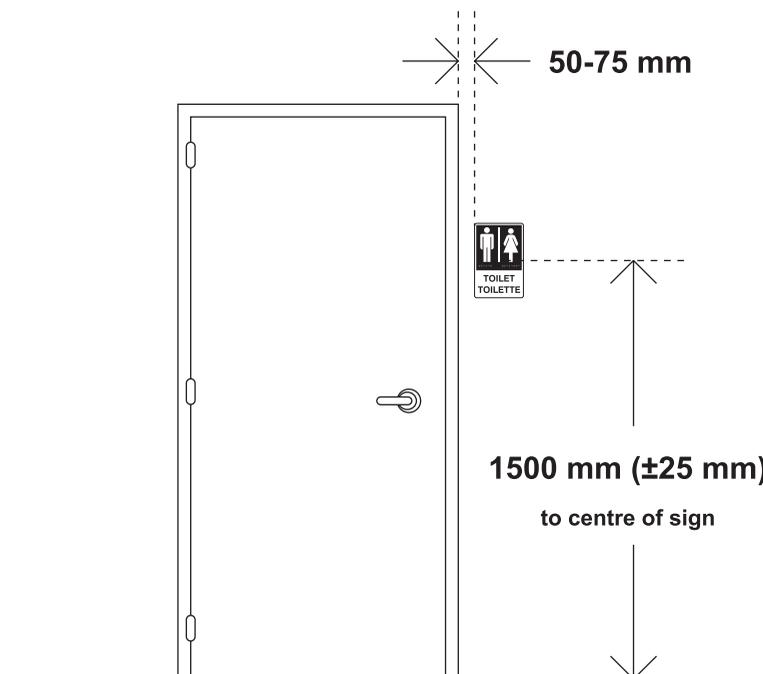
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# HH-40934-19

## TACTILE SIGNAGE

Installation:	<input checked="" type="checkbox"/> Interior:	<input type="checkbox"/> Exterior:	
Electrical specifications:			
Volts:	<input type="text" value="N/A"/>	Amp.: <input type="text" value="N/A"/>	Circ.: <input type="text" value="N/A"/>
#	Descriptions:		
1	TACTILE SIGN - 3.1.5		



**1x**

### Notes:

- SINGLE-SIDED
- SURFACE MOUNTED WITH DOUBLE-FACE TAPE
- RADIUS CORNERS

### PRODUCTION INFORMATION : XX

XX	Descriptions:	Plate #:
	XX	XX

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CUSTOMER APPROVAL :

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# HH-40934-21

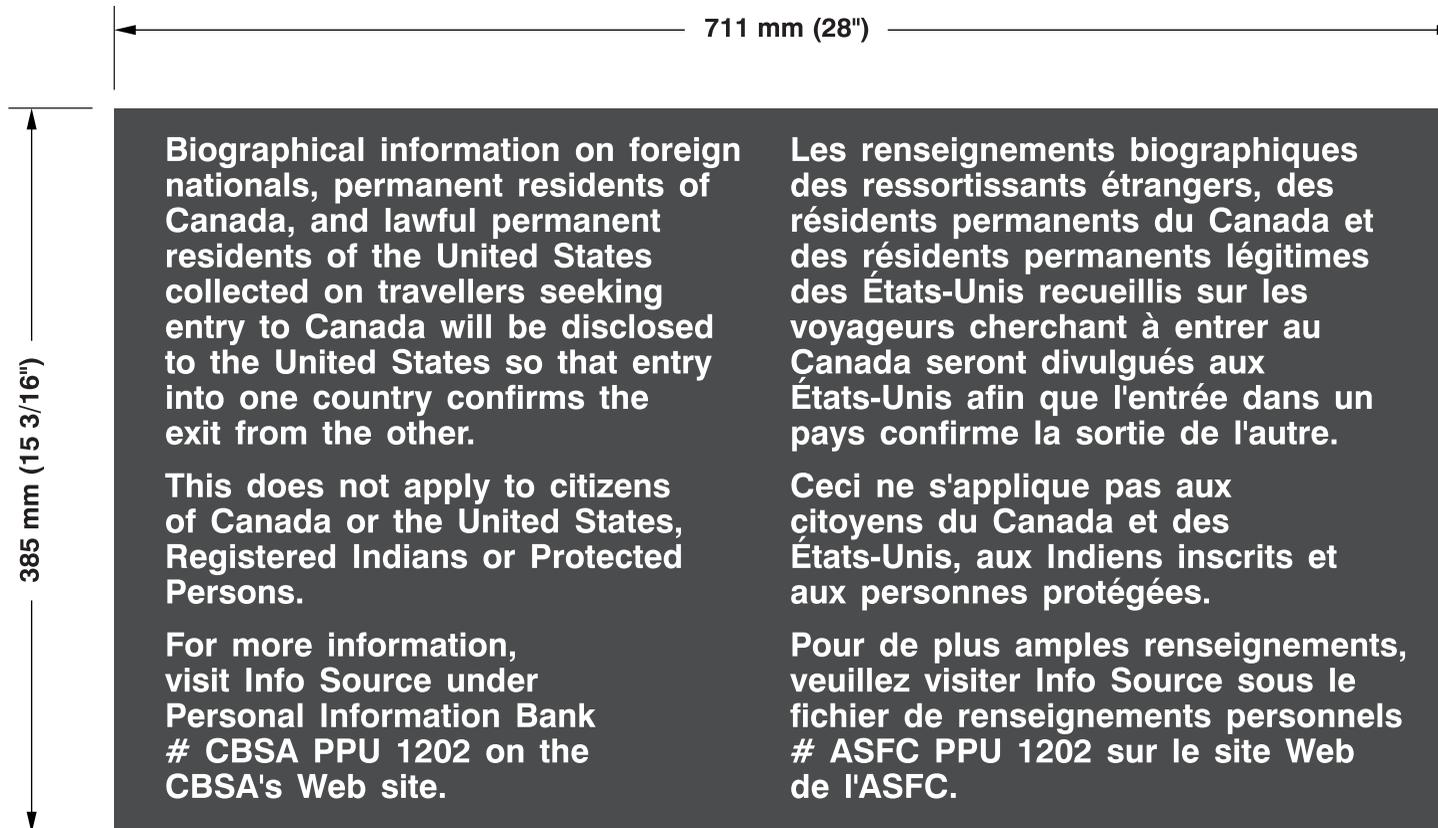
## DECALS

Installation:	<input type="checkbox"/> Interior:	<input checked="" type="checkbox"/> Exterior:			
Electrical specifications:					
Volts:	<input type="text" value="N/A"/>	Amp.:	<input type="text" value="N/A"/>	Circ.:	<input type="text" value="N/A"/>
#	Descriptions:				
1	DIGITAL PRINT INSTALLED FIRST SURFACE ON GLASS				

**2x**

<b>Notes:</b>	
-	SINGLE-SIDED
-	SURFACE MOUNTED ON GLASS (1ST SURFACE)
-	X-HEIGHT = 9 MM

#	Colors:
A	DIGITAL PRINT ON WHITE OPAQUE VINYL #IJ3650-10
B	GPS PROTECTOR #8520



<b>PRODUCTION INFORMATION : XX</b>	
XX	Descriptions: Plate #:
XX	XX

**CUSTOMER APPROVAL**

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CUSTOMER APPROVAL : \_\_\_\_\_ DATE: \_\_\_\_\_

**ENSEIGNES PATTISON SIGN GROUP**

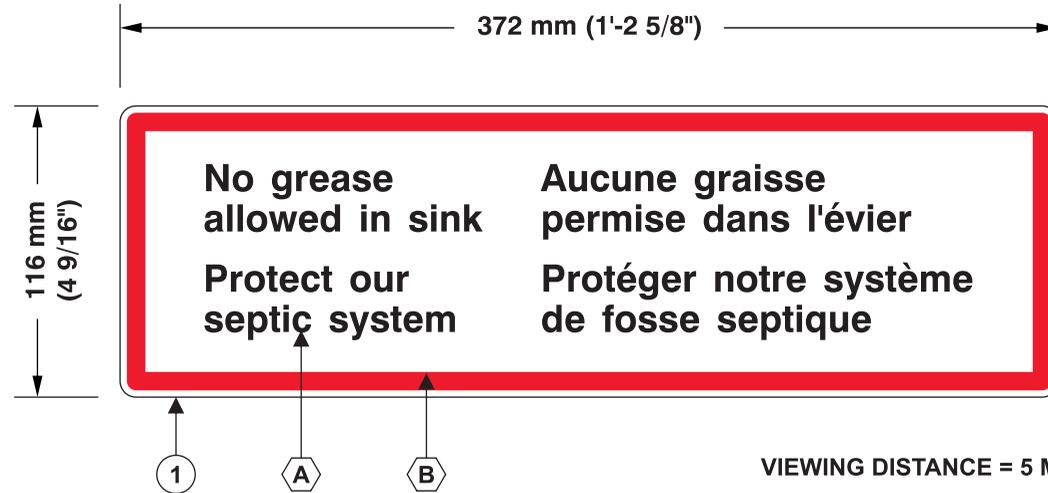
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Draftsman:	DANIEL DUROCHER	Date:	04.10.2015
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# HH-40934-22

## SINGLE-SIDED INTERIOR SIGN

Installation:	<input checked="" type="checkbox"/> Interior:	<input type="checkbox"/> Exterior:			
Electrical specifications:					
Volts:	<input type="text" value="N/A"/>	Amp.:	<input type="text" value="N/A"/>	Circ.:	<input type="text" value="N/A"/>
#	Descriptions:				
1	3 MM WHITE PVC				



**1x**

Notes:	
-	SINGLE-SIDED
-	SURFACE MOUNTED WITH DOUBLE-FACE TAPE
-	1/4" RADIUS CORNERS
-	X-HEIGHT = 8 MM

#	Colors:
A	BLACK OPAQUE VINYL 3M #7725-12
B	FIP RED OPAQUE VINYL 3M #7725-13

### PRODUCTION INFORMATION : XX

XX	Descriptions:	Plate #:
	XX	XX

**CUSTOMER APPROVAL**

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Draftsman:	DANIEL DUROCHER	Date:	04.14.2015
Checked By:	XX		
Page:	1/1	Scale:	1:3