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Public Works and  
Government Services Canada

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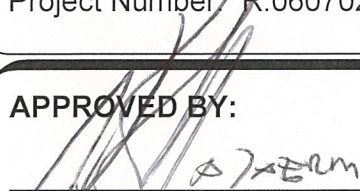
SPECIFICATIONS for:

**The Gulf of Georgia Cannery Administration  
Building – Building Enclosure Renewals**

12138 Fourth Avenue,  
Richmond, BC V7E 3J1

Project Number: R.060702.001

**APPROVED BY:**

  
Regional Manager, AES

July 10/2017  
Date

  
Construction Safety Coordinator

2017-07-10  
Date

**TENDER:**

  
Project Manager

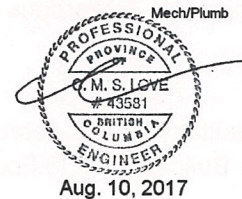
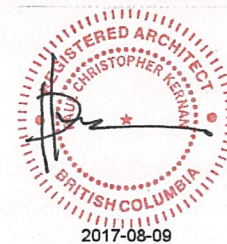
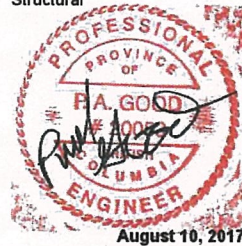
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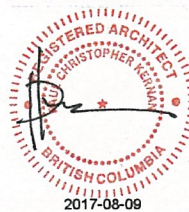
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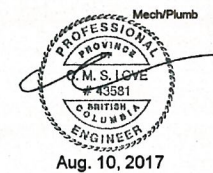


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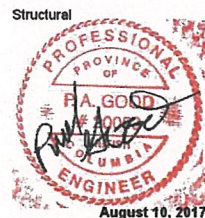
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**List of Drawings (Bound Separately)**

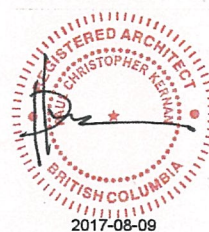
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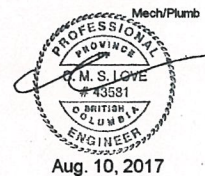
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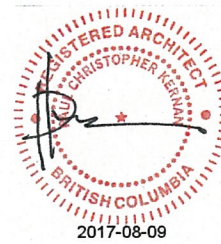
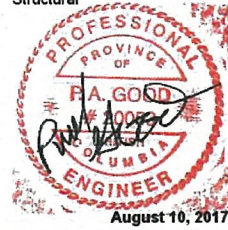


**Electrical Drawings**

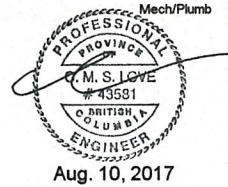
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- E11 ELECTRICAL NOTES - SHEET 1 OF 2

E12 ELECTRICAL NOTES - SHEET 2 OF 2

Structural



Mech/Plumb



## 1 GENERAL

### 1.1 SECTION INCLUDES

- .1 General description of the scope of work for the rehabilitation of the building enclosure, including but not limited to the walls, windows, doors, roof, and at-grade assemblies as well as structural (seismic), mechanical, and electrical system upgrades, at the building known as the Gulf of Georgia Cannery Administration Building located at 12138 Fourth Avenue, Richmond, BC.
- .2 This section provides only a general description of the scope of the work and process. This section is not definitive and the Work must be completed in accordance with all of the Contract Documents. The words 'install' or 'provide' mean 'supply and install' unless there is a specific instruction that the materials or products are to be re-used or Owner supplied.
- .3 The work is to be bid as a single all-inclusive lump sum tender amount.

### 1.2 SCOPE OF WORK

- .1 The following scope of work is intended to outline the general nature of the project and is not intended to limit the extent of the Work. Contractors are required to complete the Work in compliance with the Contract Documents.
- .2 Start-Up
  - .1 Supply and maintain all temporary construction facilities and services.
  - .2 Make all submittals as described in the Contract Documents and ensure project schedules are submitted and accepted at project start-up.
  - .3 Clearly identify the value of the work in each area as a percentage of the total project value and break each area into tasks, attaching the value of the work of each task as a percentage of the total project value for the purpose of evaluating applications for payment and change orders. Submit these completed schedules prior to commencing with the work.
- .3 General
  - .1 Supply for distribution a minimum of every 2 weeks a written description of the project status and specific information about the work that will affect the Owners. Increase the frequency of the submissions as necessary to keep the Owners informed. Liaise with Departmental Representative with respect to all issues impacting the building occupant's use of the site and building.
  - .2 Prepare for and attend all project progress meetings.
  - .3 Identify any landscaping items, which will prevent the timely performance of the work. Contractor to allow for removal and reinstatement of landscaping that will interfere with the work. No removal of landscaping items to take place prior to approval of the Owners.

- .4 Supply and maintain suitable scaffolding, ladders and other necessary means to access the work safely for all trades and the Departmental Representative's field representatives.
  - .5 Erect hoarding and weather protection.
  - .6 Obtain and pay for trade permits as required (not including Building Permit).
  - .7 Maintain all existing means of egress from the buildings at all times during work.
- .4 Walls – Assemblies W1, W2, W3
- .1 Protect adjoining assemblies not included in scope of work.
  - .2 Remove existing trim and associated flashings, rainwater leaders, security bars at windows, and other accessories from existing masonry wall areas included in the scope of work.
  - .3 Remove and protect various fixtures including mechanical and electrical devices as well as any other fixtures or assemblies not specifically identified to be replaced.
  - .4 Remove windows and doors included in the scope of work. Remove existing blinds and store for reuse.
  - .5 Waterproof window and door openings.
  - .6 Install new vinyl fixed lite and inward tilt-and turn operation windows as indicated, complete with heat foil laminate finish on operable vent frames.
  - .7 Install new doors.
  - .8 Connect existing security system to all new windows and doors.
  - .9 Modify penetrations including mechanical and electrical openings to accommodate new exterior insulated drained wall assembly.
  - .10 Install new sheathing membrane, self-adhesive membrane, and flashings.
  - .11 Detail and prepare all transitions to adjacent materials, components, and assemblies.
  - .12 Install new electrical boxes and outlets.
  - .13 Install new fiberglass thermal clips complete with sealant at all fastener penetrations.
  - .14 Install new mineral fibre semi rigid insulation at exterior of waterproofing membrane.
  - .15 Install new steel metal girts/ hat tracks for drained cavity.
  - .16 Install all pre-finished sheet metal flashings at all transitions in cladding material, interfaces with door and window openings, corners, custom saddle and terminations, flashing over exposed membrane on foundation walls, and parapet caps.
  - .17 Install new metal cladding as per configuration outlined on the building elevations.
  - .18 Reinstall fixtures, assemblies or devices including blinds previously removed and stored.
  - .19 Install new pre-finished aluminium louvres at windows.
  - .20 Seal all joints and penetrations.

- .5 Roof Work – R1 Low-slope Roof Assembly
  - .1 Coordinate work with rehabilitation of adjoining walls and R2 roof assemblies.
  - .2 Protect adjoining assemblies not included in scope of work.
  - .3 Remove and discard existing roof membranes, flashings, drains, vent stack, and other associated roofing accessories.
  - .4 Install new spray foam insulation at roof joist to wall interfaces.
  - .5 Install new pressure treated plywood roof diaphragm and configure as per the structural drawings.
  - .6 Install new self-adhesive vapour barrier onto new roof diaphragm.
  - .7 Install new EPS tapered slope package and mineral fibre insulation.
  - .8 Install new 2-ply SBS roof membrane and interface with adjacent assemblies and penetrations.
  - .9 Provide new drains where indicated and connect to new rainwater leaders at roof perimeter. Direct rainwater leaders onto new R2 roof canopy or at grade. Provide splash pads at all rainwater leader outlets.
  - .10 Provide new vent stack as indicated.
  - .11 Provide new cap flashings at roof parapets and other associated flashings.
  - .12 Provide new painted tongue & groove cedar wood soffits at roof overhangs.
- .6 Roof Work – New Low Slope Canopy
  - .1 Coordinate work with rehabilitation of adjoining walls and R1 roof assemblies.
  - .2 Provide new pressure treated wood-framed canopy overhang structure with attachment to the primary masonry structure, complete with new pipe columns attached to new concrete piers or foundation walls, new footings, joist hangers, steel connectors, and other associated accessories as indicated in the structural drawings.
  - .3 Provide new architectural exposed concrete upstand walls with smooth finish.
  - .4 Provide new tongue and groove cedar planks onto canopy joists. Install treated sloped plywood sheathing on sleepers.
  - .5 Install new 2-ply SBS roof membrane and interface with adjacent assemblies and penetrations.
  - .6 Provide new drains where indicated and connect to new rainwater leaders at roof perimeter. Direct rainwater leaders to scuppers through concrete curbs at grade. Provide splash pads at all rainwater leader outlets.
  - .7 Install blocking at soffit to conceal structural components as indicated.
  - .8 Install new exterior light fixtures with switch and timer settings as indicated in the electrical drawings.
- .7 Seismic Upgrading

- .1 Coordinate all seismic upgrade work with adjacent assemblies including but not limited to re-roofing, wall rehabilitation, and at-grade work.
  - .2 Upgrade connections between existing roof framing and existing masonry walls as indicated on structural drawings.
  - .3 Expose and review existing connections between glulam beam and pilasters.
  - .4 Reinforce concrete masonry unit (CMU) hollow block walls with new reinforcing steel rebar and ladder reinforcing.
  - .5 Infill masonry cores with grout as indicated on structural drawings
- .8 At-Grade Work
- .1 Remove existing concrete curb, stairs, and sidewalk at west elevation of the building as indicated.
  - .2 Install new sidewalk, ramp, and stairs at west elevation of building as indicated, complete with new handrails at accessible ramp.
    - .1 Project Archaeological Consultant is to be notified one week in advance prior to excavation. Coordinate excavation work with Archaeological Consultant and arrange to have archaeological monitor present prior to disturbing grade.
    - .2 Project geotechnical engineer is to be notified to review the sub-grade prior to installation of new fill material, slab-on-grade, and strip footing foundations.
  - .3 Install new concrete pad at east elevation of building at location of new outdoor mechanical equipment.
  - .4 Relocate existing bicycle rack to the south elevation of the building on new concrete pad.
  - .5 Make good adjacent sidewalks and re-sod soft landscaped areas following completion of at-grade work.
- .9 Storage Enclosure on North Elevation
- .1 Coordinate work with rehabilitation of adjoining walls and R1 roof assemblies.
  - .2 Relocate existing storage container to the northwest corner of the site in the parking lot, or as directed by the Owner. The storage container may be used by the Contractor as a temporary storage area for the duration of construction.
  - .3 Excavate for installation of new slab-on-grade and strip footings. Ensure no undermining of adjacent structures, including the "Amateur Radio Station" trailer during excavation.
    - .1 Project Archaeological Consultant is to be notified one week in advance prior to excavation. Coordinate excavation work with Archaeological Consultant and arrange to have archaeological monitor present prior to disturbing grade.
    - .2 Project geotechnical engineer is to be notified to review the sub-grade prior to installation of new fill material, slab-on-grade, and strip footing foundations.



- .4 Install new strip footings and slab-on-grade as indicated in the structural drawings and in accordance with the specified mix designs.
  - .5 Provide new pressure treated wood-framed storage enclosure structure with attachment to the primary masonry structure, complete with wood framed walls bearing on new concrete foundation walls and strip footings, engineered beams, joists, joist hangers, steel connectors, and other associated accessories as indicated in the structural drawings.
  - .6 Provide new treated sloped plywood sheathing on sleepers at R2 roof assembly of storage enclosure.
  - .7 Install new 2-ply SBS roof membrane and interface with adjacent assemblies and penetrations.
  - .8 Provide new drains where indicated and connect to new rainwater leaders at roof perimeter. Provide splash pads at all rainwater leader outlets.
  - .9 Install new sheathing membrane, self-adhesive membrane, and flashings at W4 wall assembly of storage enclosure.
  - .10 Detail and prepare all transitions to adjacent materials, components, and assemblies.
  - .11 Install new steel metal girts for drained cavity.
  - .12 Install all pre-finished sheet metal flashings at all transitions in cladding material, interfaces with door openings, corners, custom saddle and terminations, flashing over exposed membrane on foundation walls, and parapet caps.
  - .13 Install new metal cladding as per configuration outlined on the building elevations BE2.1.
  - .14 Provide new sliding barn door at entrance, complete with all associated hardware and accessories as indicated in BE2.1.
  - .15 Install new light fixtures complete with switch as indicated in BE1.3.
- .10 Mechanical System Demolition and Upgrades
- .1 Coordinate work with rehabilitation of adjoining walls and R1 roof assemblies.
  - .2 Remove existing furnace and domestic hot water tank, and related trim, venting, controls, ductwork etc.
  - .3 Remove existing floor registers. Cap off and abandon all existing under-slab ducts below floor level.
  - .4 Provide new ceiling mounted ductwork.
  - .5 Provide fire dampers at all duct penetrations through the mechanical room.
  - .6 Provide ULC-rated firestop systems at all roof and wall penetrations through the mechanical room.
  - .7 Provide new heat pump air handler and heat recovery ventilation unit, and tie in to new ductwork.
  - .8 Provide new exterior mounted heat pump outdoor unit and piping, on new reinforced concrete pad.
  - .9 Provide new combi boiler, venting, piping, and trim.
  - .10 Provide and connect controls and devices.
  - .11 Test, adjust, balance and commission systems.

.11 Electrical Upgrades

- .1 Coordinate work with other trades.
- .2 Coordinate work with BC Hydro.
- .3 Obtain all necessary permits and approvals from the authorities having jurisdiction.
- .4 Remove existing power connections to mechanical systems.
- .5 Remove existing 100Amp distribution panel and meter base.
- .6 Remove existing overhead service.
- .7 Provide new 200 Amp overhead service, meter base and combination panel.
- .8 Provide power to new mechanical equipment.
- .9 Re-terminate and verify all existing wiring.
- .10 Provide lighting, power for lighting and controls as indicated.
- .11 Label new equipment.
- .12 Ensure building envelope penetrations are weatherproof, that the outdoor electrical components are vandal proof and do not detract from the appearance of the building.

.12 Interior Work

- .1 Co-ordinate access for all interior work by providing the Owner's representative with a written notice a minimum of 48 hours prior to commencing work.
- .2 Allow for interior work to be undertaken outside of Parks Canada administration staff operating hours. Operating hours are 8:30AM to 5:30PM Monday to Friday.
- .3 Erect temporary enclosures and protection for finishes.
- .4 Repair any interior damage caused by the exterior wall work, inclusive of removal and replacement of doors and windows. Repairs will be limited to preparation of the surfaces to paint ready status (cracks and holes patched and primer applied).
- .5 Coordinate work with rehabilitation of adjoining walls and R1 roof assemblies.
- .6 Remove acoustic tile ceiling, wood batten for acoustic tile supports, and batt insulation inside the roof joist cavity at all interior spaces as indicated.
- .7 Remove and reinstall existing electrical and light fixtures to facilitate ceiling removal work.
- .8 Install new wood blocking to conceal structural components and new sprayfoam insulation at roof to exterior wall interfaces at the building perimeter.
- .9 Retain existing fire-rated gypsum board ceiling assembly in mechanical room. Repair and make good penetrations and existing holes to maintain fire resistance rating.

.13 Painting

- .1 Paint / stain all new and existing interior and exterior wood components including but not limited to trim, fascias, exposed joists and roof decking, and soffits. Ensure all new interior and exterior wood components are pre-primed, back-primed, and field-primed at all cut ends.
- .2 Paint all new pipe column supports at new roof canopy.

- .3 Paint new handrails at accessible ramp.
  - .4 Paint new sliding barn door at new storage room.
  - .5 Paint new plywood cladding at W3 and W4 wall assemblies inside the storage room.
  - .6 Paint new exposed ceiling-mounted mechanical ducts.
  - .7 Paint new hollow metal door and frame at the east elevation of the building.
- .14 Owner Work
- .1 Owner is responsible for relocation of any landscaping that they wish to ensure will not be damaged in the execution of the Work.
- .15 Site Clean-up
- .1 Clean site as directed in documents. Ensure that no debris is left in landscaping.

### 1.3 WORK SEQUENCE

- .1 Undertake Work in stages to accommodate Owner's continued use of premises during construction. Allow for sequencing of work as follows:
  - .1 Total contract duration: 8 months.
  - .2 Interior demolition work to commence at month 3, and be complete within 2 weeks.
  - .3 Mechanical and electrical rough-in to commence at month 4, and be complete within 4 weeks.
  - .4 Interior finishing and repairs to commence at month 7, and be complete within 4 weeks.
  - .5 Window and door rough opening preparation and installation:
    - .1 No more than two windows or doors at a time to be removed.
    - .2 Rough openings are not allowed to be left open overnight.

### 1.4 OWNER OCCUPANCY

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

## 2 PRODUCTS (NOT APPLICABLE)

## 3 EXECUTION (NOT APPLICABLE)

END OF SECTION



## **1 GENERAL**

### **1.01 WORK DESCRIBED BY CONTRACT DOCUMENTS**

- .1 The work of this contract comprises of the following scopes at the Gulf of Georgia Cannery Administration Building, located at 12138 Fourth Avenue, Richmond BC.:
  - .1 Building enclosure renewals,
  - .2 Partial seismic upgrades,
  - .3 Mechanical and electrical system upgrades.
- .2 Work to be performed under this Contract includes items covered in section 01 01 10 – Scope of Work of Contract documents and the following:
  - .1 Review of testing reports provided with Contract documents. Based on findings of testing reports provided with Contract documents: Contractor to determine if asbestos and lead abatement procedure is required.
  - .3 Contractor shall take possession of the project area and be contractually responsible for all construction activities. Cooperate with Parks Canada in scheduling operations to minimize conflict and to facilitate usage.

### **1.02 TIME OF COMPLETION**

- .1 Commence work upon notification of acceptance and complete work within twenty four (24) weeks.

### **1.03 MINIMUM STANDARDS**

- .1 Work to conform to the minimum applicable standards of the Canadian General Standards Board, the Canadian Standards Association, the National Building Code of Canada 2015 (NBC) and applicable Provincial and Municipal codes. In the case of conflict or discrepancy, the most stringent requirement applies.
- .2 Work must be carried out in conformance to WorkSafe BC safety standards and requirements.
- .3 Meet or exceed requirements of Contract documents, specified standards, codes and referenced documents.

### **1.04 CONTRACT DOCUMENTS**

- .1 The Contract documents, drawings and specifications are intended to complement each other, and to provide for and include everything necessary for the completion of the work. Drawings are, in general, diagrammatic and are intended to indicate the scope and general arrangement of the work. Drawings have been prepared in colour for clarity purposes and are intended to be printed in colour. Contractor is responsible for any misinterpretations caused as a result of printing in black and white.

### **1.05 DIVISION OF SPECIFICATIONS**

- .1 The specifications are subdivided in accordance with the current 6-digit National Master Specifications System.

- .2 A division may consist of the work of more than one subcontractor. Responsibility for determining which subcontractor provides the labour, material, equipment and services required to complete the work rests solely with the Contractor.
- .3 In the event of discrepancies or conflicts when interpreting the drawings and specifications, the specifications govern.

#### **1.06 TAXES**

- .1 Pay all taxes properly levied by law (including Federal, Provincial and Municipal).

#### **1.07 REGULATORY REQUIREMENTS**

- .1 A Building Permit is not required. Obtain and pay for - Certificates, Licenses and other permits required by regulatory municipal, provincial or federal authorities to complete the work.
- .2 Provide inspection authorities with plans and information required for issue of acceptance certificates.
- .3 Furnish inspection certificates in evidence that the work installed conforms with the requirements of the authority having jurisdiction.

#### **1.08 PROJECT MEETINGS**

- .1 Contractor will schedule a project start-up meeting following notice of acceptance.
- .2 Agenda to include lines of communication, contact information, scheduling and coordination.
- .3 Subsequent meetings will be called as required.

#### **1.09 CONTRACTOR'S USE OF SITE**

- .1 Use of site:
  - .1 The Gulf of Georgia Cannery Administration Building will remain open. Parks Canada Western Region has control over the building. All activities and security controls must remain operational at all times unless otherwise indicated. Coordinate with the Departmental Representative for all activities that impact on-going operations.
  - .2 Work restrictions and security provisions will be enforced.
  - .3 Assume responsibility for assigned premises for laydown and storage areas as indicated and for performance of this work.
  - .4 Be responsible for coordination of all work activities on site, including the work of other contractors engaged by the Departmental Representative.
- .2 Perform work in accordance with Contract documents.
- .3 Do not unreasonably encumber site with material or equipment.
- .4 Maintain scaffolding and hoarding throughout duration of work. Do not exceed areas indicated unless written approval by Departmental Representative is provided.
- .5 Execute work with least possible interference or disturbance to normal use. Make arrangements with Departmental Representative to facilitate work as stated.

- .6 Maintain existing services and provide for personnel, visitor and vehicle access.
- .7 Where security is reduced by work, provide temporary means to maintain security. Review measures with Departmental Representative before proceeding.

#### **1.10 HOURS OF WORK**

- .1 The Gulf of Georgia Cannery Administration Building is operational for staff daily from 08:30 to 17:30.
  - .1 Interior work must be carried out after hours or phased in coordination with Parks Canada staff to ensure continued use of Administration Building by staff.
- .2 Hours of work:
  - .1 Contractor may submit work schedule in cooperation with Departmental Representative.
- .3 Notify Departmental Representative and seek approval of all after hours work, including weekends and holidays.

#### **1.11 SECURITY**

- .1 For Contractor access to building interior and for contractor access to exterior work after 17:30 hours, coordinate with and pay for the services of a commissionaire from the BC Commissionaires from the time of beginning work on site until substantial completion of the work. The contractor shall provide the Departmental Representative with an estimate of the total cost for that requirement after contract award at which time the Departmental Representative will then contract directly with Commissionaires BC for that work and pay for those costs directly accordingly since they will not work directly for the contractor. Upon completion of the contract work, a change order credit will be issued for the full cost of the Commissionaires so the contractor shall allow for that cost in their contract pricing. Contractor can refer to the following web site as a reference:  
<http://www.commissionaires.bc.ca>
- .2 Provide required service for any security to contractor's forces for further works to be done between substantial and final completion.

#### **1.12 NON SMOKING ENVIRONMENT**

- .1 Smoking is not permitted on site.

#### **1.13 WORK SCHEDULE**

- .1 Provide detailed project schedule (Gantt Bar Chart) within 5 working days of Award of Contract date showing activity sequencing, interdependencies and duration estimates. Include listed activities as follows:
  - .1 Shop drawings.
  - .2 Samples.
  - .3 Approvals.
  - .4 Procurement.
  - .5 Construction.
  - .6 Installation.
  - .7 Site works.
  - .8 Testing.
  - .9 Acceptance.

- .2 Do not change approved schedule without notifying and receiving approval from Departmental Representative.
- .3 Interim reviews of work progress based on work schedule will be conducted as decided by Departmental Representative and schedule updated by Contractor in conjunction with and to approval of Departmental Representative.
- .4 Schedule Work in consultation with Departmental Representative to minimize impact on public use of facility during operating hours.

#### **1.14 SUBMITTALS**

- .1 Product Data: Manufacturers catalogue sheets, brochures, literature, performance charts and diagrams.
  - .1 Submit electronic copies of documentation.
  - .2 Delete information not applicable to project.
  - .3 Cross-reference product data information to applicable portion of Contract Documents.
- .2 Samples: examples of materials, equipment, quality, finishes and workmanship.
  - .1 Provide two samples of each material as indicated in technical sections.
  - .2 Where colour, pattern or texture is criterion, submit full range of samples.
  - .3 Reviewed and accepted samples will become standard of workmanship and material against which installed work will be verified.
- .3 Shop Drawings:
  - .1 Submit electronic copies of all shop drawings to include:
    - .1 Date.
    - .2 Project Title and number.
    - .3 Name and address of Subcontractor, Supplier and Manufacturer.
    - .4 Fabrication.
    - .5 Key plan and layout, showing dimensions, including identified field dimensions and clearances.
    - .6 Setting or erection details.
    - .7 Relationship to adjacent work.
    - .8 Contractor's stamp, signed by Contractor's authorized representative certifying approval of submissions, verification of field measurements and compliance with Contract Documents.
    - .9 Revised shop drawing submissions to be bubbled identifying revisions.
  - .2 Submit drawings stamped and signed by professional engineer registered and licensed in the Province of British Columbia as indicated.

#### **1.15 COST BREAKDOWN**

- .1 Before submitting the first progress claim, submit a breakdown of the Contract lump sum prices in detail as directed by the Departmental Representative and aggregating Contract price.

#### **1.16 DOCUMENTS REQUIRED**

- .1 Maintain at job site, one copy each document as follows:
  - .1 Contract Drawings.
  - .2 Contract Specifications.
  - .3 Addenda to Contract Documents.
  - .4 Copy of approved work schedule.



- .5 Environmental Protection Plan.
- .6 Reviewed and approved Shop Drawings.
- .7 List of Outstanding Shop Drawings.
- .8 Change Orders.
- .9 Other Modifications to Contract.
- .10 Field Test Reports.
- .11 Reviewed and approved samples.
- .12 Copy of Approved Work Schedule.
- .13 Manufacturer's installation and application instructions.
- .14 National Building Code, 2015.
- .15 Health and Safety Plan and Other Safety Related Documents.
- .16 Other documents as specified.

#### **1.17 HEALTH, SAFETY AND HAZARDOUS MATERIALS**

- .1 Comply with Canada Labour Code, Part 2, Canada Occupational Safety and Health Regulations.
- .2 Comply with British Columbia Workers Compensation Act.
- .3 Perform duties in accordance with the British Columbia Occupational Health and Safety Regulation.
- .4 Submit copies of WCB Clearance Letter and WCB Contractor Rating. Submit copy of Final WCB Clearance Letter at completion of project.
- .5 Submit letter stating that Contractor assumes the role of Prime Contractor for the purposes of site safety responsibility and the Workers Compensation Act.
- .6 Submit copies of work site health and safety meeting minutes, inspection reports, reports or directions issued by Federal, Provincial or Municipal health and safety inspectors, incident and accident reports, and follow-up reports.
- .7 Work at site may involve contact with PCB and lead-containing paint. Take appropriate precautions.
- .8 Notify the Departmental Representative 48 hours for access to interior work and advise if work involves hazardous substances (Canada Labour Code, Part II, Section 10) or caulking.
- .9 Ensure fire code requirements are continued to be met during the course of construction. Ensure emergency exits from the building, exterior emergency egress paths, or access areas for emergency vehicles are not restricted.

#### **1.18 EXAMINATION**

- .1 Examine site and be familiar and conversant with existing conditions likely to affect work.
- .2 Provide photographs of surrounding objects and structures liable to be damaged or be the subject of subsequent claims (photographs not to include staff on duty).

#### **1.19 EXISTING SERVICES**

- .1 Where work involves breaking into or connecting to existing services, carry out work at times directed by the authorities having jurisdiction.

**1.20 LOCATION OF EQUIPMENT AND FIXTURES**

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

**1.21 SETTING OUT OF WORK**

- .1 Assume full responsibility for and execute complete layout of work to locations, lines and elevations indicated.
- .2 Provide devices needed to lay out and construct work.

**1.22 ACCEPTANCE OF SUBSTRATES**

- .1 Each trade shall examine surfaces prepared by others and job conditions which may affect his work, and shall report defects to the Contractor. Commencement of work shall imply acceptance of prepared work or substrate surfaces.

**1.23 QUALITY OF WORK**

- .1 Remedial Work:
  - .1 Perform remedial work by specialists familiar with materials affected. Perform in a manner to neither damage nor put at risk any portion of work.
  - .2 Perform remedial work required to repair or replace part or portions of Work identified as defective or unacceptable. Coordinate adjacent affected Work as required.
- .2 Ensure that quality workmanship is performed through use of skilled and experienced tradesmen, under supervision of qualified journeyman.
- .3 The workmanship, erection methods and procedures to meet minimum standards set out in the National Building Code Construction Standards.
- .4 In cases of dispute, decisions as to standard or quality of work rest solely with the Departmental Representative whose decision is final.

**1.24 WORKS COORDINATION**

- .1 Coordinate work of subtrades:
  - .1 Designate one person to be responsible for review of contract documents and shop drawings and managing coordination of Work.
- .2 Convene meetings between subcontractors whose work interfaces and ensure awareness of areas and extent of interface required.
  - .1 Provide each subcontractor with complete plans and specifications for Contract, to assist them in planning and carrying out their respective work.

- .2 Develop coordination drawings when required, illustrating potential interference between work of various trades and distribute to affected parties.
  - .1 Pay particularly close attention to overhead work or near to building structural elements, including existing roof.
  - .2 Identify on coordination drawings, building elements and interface requirements.
- .3 Facilitate meeting and review coordination drawings. Ensure subcontractors agree and sign off on drawings.
- .4 Publish minutes of each meeting.
- .5 Submit copy of coordination drawings and meeting minutes to Departmental Representative for information purposes.
- .3 Submit shop drawings and of rebuilt components only after coordination meeting for such items has taken place.
- .4 Work cooperation:
  - .1 Ensure cooperation between trades in order to facilitate general progress of Work and avoid situations of interference.
  - .2 Ensure that each trade provides all other trades reasonable opportunity for completion of Work and in such a way as to prevent unnecessary delays, patching and removal or replacement of completed work.
  - .3 Ensure disputes between subcontractors are resolved.
- .5 Departmental Representative is not responsible for, or accountable for extra costs incurred as a result of Contractor's failure to coordinate Work.
- .6 Maintain efficient and continuous supervision. Full-time site superintendent required throughout project.

#### **1.25 APPROVAL OF SHOP DRAWINGS, PRODUCT DATA AND SAMPLES**

- .1 In accordance with Section 01 33 00 - Submittals Procedures, submit the requested shop drawings, product data, MSDS sheets and samples indicated in each of the technical Sections.
- .2 Allow sufficient time for the following:
  - .1 Review of product data.
  - .2 Approval of shop drawings.
  - .3 Review of re-submission.
  - .4 Ordering of approved material and/or products - refer to technical sections.

#### **1.26 TESTING AND INSPECTIONS**

- .1 Particular requirements for inspection and testing to be carried out by testing service or laboratory approved by the Departmental Representative.
- .2 The Contractor will appoint and pay for the services of testing agency or testing laboratory as specified, and where required for the following:
  - .1 Inspection and testing required by laws, ordinances, rules, regulations or orders of public authorities.
  - .2 Inspection and testing performed exclusively for Contractor's convenience.
    - .1 Mill tests and certificates of compliance.
    - .2 MPI Painting Inspections.
    - .3 Tests specified to be carried out by Contractor under the Departmental Representative's supervision.

- .3 Where tests or inspections by designated testing laboratory reveal work is not in accordance with the Contract requirements, Contractor shall pay costs for additional tests or inspections as the Departmental Representative may require to verify acceptability of corrected work.
- .4 Contractor shall furnish labour and facilities to:
  - .1 Notify Departmental Representative in advance of planned testing.
- .5 Where materials are specified to be tested, deliver representative samples in required quantity to testing laboratory.
- .6 Pay costs for uncovering and making good work that is covered before required inspection or testing is completed and approved by Departmental Representative.
- .7 The Departmental Representative may require, and pay for, additional inspection and testing services.
- .8 Provide Departmental Representative with 2 copies of testing laboratory reports as soon as they are available.

#### **1.27 AS-BUILT DOCUMENTS**

- .1 The Departmental Representative will provide 2 sets of drawings, 2 sets of specifications, for "as-built" purposes.
- .2 As work progresses, maintain accurate records to show all deviations from the Contract documents. Note on as-built specifications, drawings and shop drawings as changes occur.

#### **1.28 CLEANING**

- .1 Daily conduct cleaning and disposal operations. Comply with local ordinances and anti-pollution laws.
- .2 Ensure cleanup of the work areas each day after completion of work.
- .3 In preparation for interim and final inspections:
  - .1 Examine all sight-exposed exterior surfaced and concealed spaces.
  - .2 Remove grease, dust, dirt, stains, labels, fingerprints, and other foreign materials from sight-exposed exterior finished surfaces, including glass.
- .4 Use cleaning materials and methods in accordance with instructions of the manufacturer of the surface to be cleaned.

#### **1.29 PUBLIC WAY CONSTRUCTION**

- .1 Design, erect and maintain hoarding and covered pedestrian walkways to support all loads including windloads and provide protection, complete with signs and electrical lighting as required by authority having jurisdiction and Departmental Representative.

#### **1.30 RELICS AND ANTIQUITIES**

- .1 Relics and antiquities and items of historical or scientific interest shall remain property of Department. Protect such articles and request directives from Departmental Representative.

- .2 Give immediate notice to Departmental Representative if evidence of historical or archeological finds are encountered during remediation work and await Departmental Representative's written instructions before proceeding with work in this area.

### **1.31 ENVIRONMENTAL PROTECTION**

- .1 Contractor is responsible for environmental protection during all construction activities at all locations work is performed.
- .2 Prevent extraneous materials from contaminating air beyond construction area, by providing temporary extensions to Mechanical intake louvres during work.
- .3 Environmental degradation arising from construction activities shall be prevented, abated, controlled and minimized by complying with all applicable federal, provincial and local laws and regulations concerning environmental pollution control and abatement.
- .4 Do not dispose of waste or volatile materials into water courses, storm or sanitary sewers. Construction methods shall be employed to ensure no fuels, oils, wood preservatives or other contaminants enter the Fraser River. As general Mitigation Measures for this project, it must be enforced and closely supervised and monitored as follows:
  - .1 All contractors and work crews must be briefed upon the importance of adhering to prescribed best practices or mitigation measures. Project meeting prior to commencement of the work shall indicate the above requirements have been fully explained to the contractor and staff.
  - .2 A copy of the mitigation measures shall be posted in a conspicuous location on site or readily accessible for reference.
  - .3 Conduct work in a manner which clearly separates visitors from the active construction area on site to minimize potential accidents for public safety.
  - .4 Contractor and sub trade personnel must develop and maintain spill response and reporting procedures including containment methods. In the event of a spill, contact the Provincial Emergency Program at 1-800-663-3456.
  - .5 The Contractor is to have personnel on site that are trained and ready to use spill containment kits. Ensure proper disposal procedures in accordance with all applicable provincial and municipal regulations. Fires and burning of rubbish on site is not permitted.
  - .6 The Contractor must have all spill containment kits ready for immediate deployment, containing sufficient quantities of absorbent materials on site in close proximity to working machinery and equipment such as fuel portable generator, air compressors, hoist and tools.
  - .7 Ensure all equipment used on site is clean and free from contaminants.
- .5 Ensure proper disposal procedures in accordance with all applicable provincial regulations.

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

- .1 Specific requirements for maintenance materials, tools and spare parts are specified in individual technical sections.

### **1.33 ADDITIONAL DRAWINGS**

- .1 The Departmental Representative may furnish additional drawings for clarification. These additional drawings have the same meaning and intent as if they were included with plans referred to in the Contract documents.

- .2 Upon request, Departmental Representative may furnish up to a maximum of 5 sets of Contract documents for use by the Contractor at no additional cost. Should more than 5 sets of documents be required the Departmental Representative will provide them at additional cost.

**1.34 SYSTEM OF MEASUREMENT**

- .1 The metric system of measurement (SI) will be employed on this Contract.

**1.35 SUBMISSION OF TENDER**

- .1 Submission of a tender is deemed to be confirmation of the fact that the Tenderer has analyzed the Contract documents and inspected the site, and is fully conversant with all conditions.

**2 PRODUCTS**

**2.01 NOT USED**

- .1 Not used.

**3 EXECUTION**

**3.01 NOT USED**

- .1 Not used.

**END OF SECTION**

**1 GENERAL**

**1.01 ACCESS AND EGRESS**

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

**1.02 USE OF SITE AND FACILITIES**

- .1 Execute work with least possible interference or disturbance to normal use of premises. Make arrangements with Departmental Representative to facilitate work as stated.
- .2 Maintain existing services to building and provide for personnel and vehicle access.
- .3 Where security is reduced by work provide temporary means to maintain security as approved by Departmental Representative.
- .4 Washroom facilities are available at the free-standing public washroom building located by the main entry of Cannery building. Workers may use the public washroom facilities.
- .5 The areas immediately adjacent to the building on the west and south elevations may be used by the Contractor as laydown areas. The areas are to be re-sodded and made good after use.
- .6 Five (5) visitor parking passes, valid for duration of the work will be allocated to the Contractor for the visitor's parking lot. Work trucks will be allowed to be located in the Contractor's laydown area where indicated. Additional parking will be permitted where directed by Departmental Representative. Do not occupy any other parking areas without the approval of the Departmental Representative.
- .7 The existing storage container adjacent to the building is to be relocated as directed by the Departmental Representative. The relocated storage container may be temporarily used as a storage facility by the Contractor for the duration of the Contract. The Contractor assumes all risk and responsibility for any damage caused to the storage container during use.

**1.03 HOURS OF WORK**

- .1 The Administration Building is operational daily from 08:30 to 17:30 for staff. Contractor may set his own schedule of work onsite, within restrictions specified. Submit proposed hours-of-work to Departmental Representative for review and approval with Work in accordance with Section 01 11 55 – General Instructions.
- .2 Contractor must give Departmental Representative 48 hours notice of construction activity requiring access to the interior of the buildings.

**1.04 ALTERATIONS AND REPAIRS TO EXISTING BUILDING**

- .1 Execute work with least possible interference or disturbance to building operations occupants, public and normal use of premises.
- .2 Maintain existing services and abide by regulations for personnel and vehicle access.

- .3 Any work which impacts the operations onsite must have one (1) week notice and must be approved by Departmental Representative.
- .4 Construction crews are not permitted to use washrooms in the main building. Refer to Section 01 51 00 – Temporary Utilities.

#### **1.05 EXISTING SERVICES**

- .1 Notify Departmental Representative and utility companies of intended interruption of services and obtain required permission.
- .2 Where work involves breaking into or connecting to existing services, give Departmental Representative one (1) week notice for permission. The maximum number of shut-down periods, is limited to four (4) for duration of the project.
- .3 Construct barriers in accordance with Section 01 55 00 - Temporary Facilities and Controls.
- .4 Contractor will be held responsible for damages to facility equipment as the result of service shut-downs.
- .5 Contractor will be held responsible for unscheduled shut-downs of building utilities and services.
- .6 Contractor will not be allowed to connect to Owner's existing data and communication services for his own use.

#### **1.06 SPECIAL REQUIREMENTS**

- .1 Security Cameras:
  - .1 Security cameras to remain operational. Cameras requiring temporary relocation to be serviced as directed by Departmental Representative.
- .2 Ensure Contractor's personnel employed on site become familiar with and obey regulations including safety, fire, traffic and security regulations.
- .3 Keep within limits of work and avenues of ingress and egress. Respect properties adjacent to work site, providing continued access for public vehicular and pedestrian traffic.
- .4 Noise Generation:
  - .1 Means and procedures of controlling and isolating other excessive or disturbing noise and vibration affecting occupied areas shall be the responsibility of the Contractor and approved by the Departmental Representative.

#### **1.07 SECURITY**

- .1 Be accountable for tools/equipment at all times. Do not leave tools unattended and/or within reach of the travelling public.
- .2 Act professionally at all times. No foul language or rude behavior.
- .3 Do not interact with the public, unless authorized to do so where required.

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

- .1 Comply with smoking restrictions. Smoking is not permitted on the site.



**2 PRODUCTS**

**2.01 NOT USED**

.1 Not Used.

**3 EXECUTION**

**3.01 NOT USED**

.1 Not Used.

**END OF SECTION**



**1 GENERAL**

**1.01 ADMINISTRATIVE**

- .1 Contractor will arrange pre-construction project meeting.
- .2 Contractor to assume responsibility for setting meeting times and recording and distributing meeting minutes. Contractor to attend project meetings throughout the progress of the work and at the call of Departmental Representative.
- .3 Contractor to provide physical space and make arrangements for progress meetings.
- .4 Representative of Contractor, Subcontractor and suppliers attending meetings will be qualified and authorized to act on behalf of party each represents.

**1.02 PRECONSTRUCTION MEETING**

- .1 Contractor will:
  - .1 Within ten (10) days after award of Contract, request a meeting of parties in contract to discuss and resolve administrative procedures and responsibilities.
  - .2 Departmental Representative, Contractor, major Subcontractors, field reviewers and supervisors will be in attendance.
  - .3 Establish time and location of meeting and notify parties concerned minimum five (5) days before meeting.
  - .4 Incorporate mutually agreed variations to Contract Documents into Agreement, prior to signing.
- .2 Provide Agenda, to include:
  - .1 Schedule of Work: in accordance with Section 01 11 55 – General Instructions – Bar (Gantt) Chart.
  - .2 Schedule of submission of shop drawings and samples. Submit submittals in accordance with Section 01 33 00 - Submittal Procedures.
  - .3 Requirements for temporary facilities, site sign, offices, storage sheds, utilities, fences in accordance with Section 01 52 00 - Construction Facilities.
  - .4 Delivery schedule of specified equipment.
  - .5 Site security in accordance with Section 01 55 00 - Temporary Facilities and Controls.
  - .6 Proposed changes, change orders, procedures, approvals required, mark-up percentages permitted, time extensions, overtime, administrative requirements.
  - .7 Record drawings in accordance with Section 01 78 00 - Closeout Submittals.
  - .8 Take-over procedures, acceptance, warranties in accordance with Section 01 78 00 - Closeout Submittals.
  - .9 Monthly progress claims, administrative procedures, photographs, hold backs.
  - .10 Appointment of inspection firms.
  - .11 Insurances, transcript of policies.

**1.03 PROGRESS MEETINGS**

- .1 Contractor will:
  - .1 During course of Work and up to project completion, schedule progress meetings every two weeks. Additional meetings will be scheduled to resolve extraordinary issues as required.
  - .2 Contractor, major Subcontractors involved in Work and Departmental Representative are to be in attendance.

- .3 Notify parties minimum three (3) days prior to meetings.
- .4 Contractor will record minutes of progress meetings and circulate to attending parties and affected parties not in attendance.
- .5 Provide Agenda. Agenda to include the following:
  - .1 Review, approval of minutes of previous meeting.
  - .2 Review of Work progress since previous meeting.
  - .3 Field observations, problems, conflicts.
  - .4 Problems which impede construction schedule.
  - .5 Review of off-site fabrication delivery schedules.
  - .6 Corrective measures and procedures to regain projected schedule.
  - .7 Revision to construction schedule.
  - .8 Progress schedule, during succeeding work period.
  - .9 Review submittal schedules: expedite as required.
  - .10 Maintenance of quality standards.
  - .11 Review proposed changes for affect on construction schedule and on completion date.
  - .12 Other business.

**2 PRODUCTS**

**2.01 NOT USED**

- .1 Not Used.

**3 EXECUTION**

**3.01 NOT USED**

- .1 Not Used.

**END OF SECTION**

**1 GENERAL**

**1.01 RELATED REQUIREMENTS**

- .1 Section 03 30 53 – Miscellaneous Cast-In-Place Concrete.
- .2 Section 05 50 00 – Metal Fabrications.
- .3 Section 05 73 00 – Aluminum Guardrails.
- .4 Section 07 21 00 – Thermal Insulation.
- .5 Section 07 25 00 – Weather Barriers.
- .6 Section 07 27 13 – Modified Bituminous Sheet Air Barriers.
- .7 Section 07 42 13 – Composite Metal Panels.
- .8 Section 07 52 16 – Conventional SBS Roofing Combustible Substrates.
- .9 Section 07 92 00 – Joint Sealants.
- .10 Section 08 53 13 – Plastic Windows and Doors.
- .11 Section 09 90 00 – Painting and Coating.

**1.02 APPROVALS**

- .1 Approval of shop drawings: refer to Section 01 11 55 – General Instructions.

**1.03 ADMINISTRATIVE**

- .1 This Section specifies the general requirements and procedures for the Contractor's submissions of shop drawings, product data, samples and other requested submittals to Departmental Representative for review. Additional specific requirements for submissions are specified in individual technical sections.
- .2 Present shop drawings, product data, samples and mock-ups in SI Metric units.
- .3 Where items or information is not produced in SI Metric units converted values are acceptable.
- .4 Contractor's responsibility for errors and omissions in submission is not relieved by Departmental Representative's review of submittals.
- .5 Notify Departmental Representative, in writing at time of submission, identifying deviations from requirements of Contract Documents stating reasons for deviations.
- .6 Contractor's responsibility for deviations in submission from requirements of Contract Documents is not relieved by Departmental Representative review unless Departmental Representative gives written acceptance of specific deviations.
- .7 Make any changes in submissions which Departmental Representative may require consistent with Contract documents and resubmit as directed by Departmental Representative.

- .8 Notify Departmental Representative in writing, when resubmitting, of any revisions other than those requested by Departmental Representative.
- .9 Do not proceed with work or order construction materials or products until relevant submissions are reviewed and approved by the Departmental Representative.
- .10 Review submittals prior to submission to Departmental Representative. This review represents that necessary requirements have been determined and verified, or will be, and that each submittal has been checked and coordinated with requirements of Work and Contract Documents. **Submittals not stamped, signed, dated and identified as to specific project will be returned without being examined and considered rejected.**
- .11 Verify field measurements and affected adjacent Work are coordinated.
- .12 Keep one reviewed copy of each submission on site.

#### 1.04 SUBMISSION REQUIREMENTS

- .1 Coordinate each submission with the requirements of the work and the Contract documents. Individual submissions will not be reviewed until all related information is available.
- .2 Accompany submissions with transmittal letter, in duplicate, containing:
  - .1 Date.
  - .2 Project title and number.
  - .3 Contractor's name and address.
  - .4 Identification and quantity of each shop drawing, product data and sample.
  - .5 Other pertinent data.
- .3 Submissions shall include:
  - .1 Date and revision dates.
  - .2 Project title and number.
  - .3 Name and address of:
    - .1 Subcontractor.
    - .2 Supplier.
    - .3 Manufacturer.
  - .4 Contractor's stamp, signed by Contractor's authorized representative, certifying approval of submissions, verification of field measurements and compliance with Contract documents. **Submittals not stamped, signed, dated and identified as to specific project will be returned without being examined and considered rejected.**
  - .5 Details of appropriate portions of work as applicable:
    - .1 Fabrication.
    - .2 Layout, showing dimensions (including identified field dimensions) and clearances.
    - .3 Setting or erection details.
    - .4 Capacities.
    - .5 Performance characteristics.
    - .6 Standards.
    - .7 Operating weight.
    - .8 Relationship to adjacent work.
- .4 After Departmental Representative's review, distribute copies. Keep one reviewed copy of each submission on site.

## 1.05 SHOP DRAWINGS

- .1 Shop drawings: original drawings or modified standard drawings, diagrams, illustrations, schedules, performance charts, brochures or other data provided by Contractor to illustrate details of portions of work which are specific to project requirements.
  - .1 Indicate materials, methods of construction and attachment or anchorage erection diagrams, connections, explanatory notes and other information necessary for completion of Work. Where articles or equipment attach or connect to other articles or equipment, indicate that such items have been coordinated, regardless of Section under which adjacent items will be supplied and installed. Provide cross references to drawings and specifications.
- .2 Submit electronic drawings for each requirement requested in technical specification sections and as requested by Departmental Representative. Cross-reference shop drawing information to applicable portions of the Contract documents.
- .3 Submit electronic copies of product data sheets or brochures for requirements requested in specification Sections and as requested by Departmental Representative where shop drawings will not be prepared due to standardized manufacture of product.
- .4 Submit electronic copies of test reports for requirements requested in specification Sections and as requested by Departmental Representative.
  - .1 Report signed by authorized official of testing laboratory that material, product or system identical to material, product or system to be provided has been tested in accord with specified requirements.
  - .2 Testing must have been within 3 years of date of contract award for project.
- .5 Submit electronic copies of certificates for requirements requested in specification Sections and as requested by Departmental Representative.
  - .1 Statements printed on manufacturer's letterhead and signed by responsible officials of manufacturer of product, system or material attesting that product, system or material meets specification requirements.
  - .2 Certificates must be dated after award of project contract complete with project name, project number and address.
- .6 Submit electronic copies of manufacturer's instructions for requirements requested in specification Sections and as requested by Departmental Representative.
  - .1 Pre-printed material describing installation of product, system or material, including special notices and Material Safety Data Sheets concerning impedances, hazards and safety precautions.
- .7 Submit electronic copies of Manufacturer's Field Reports for requirements requested in specification Sections and as requested by Departmental Representative.
- .8 Documentation of the testing and verification actions taken by manufacturer's representative to confirm compliance with manufacturer's standards or instructions.
- .9 Submit electronic copies of Operation and Maintenance Data for requirements requested in specification Sections and as requested by Departmental Representative.
- .10 Delete information not applicable to project.
- .11 Supplement standard information to provide details applicable to project.

**1.06 SHOP DRAWING REVIEW**

- .1 Review of shop drawings by the Departmental Representative is for the sole purpose of ascertaining conformance with the general concept.
- .2 Allow seven (7) business days for Departmental Representative's review of each submission.
- .3 This review shall not mean that the Departmental Representative approves the detail design inherent in the shop drawings, responsibility for which shall remain with Contractor submitting same.
- .4 This review shall not relieve the Contractor of responsibility for errors or omissions in the shop drawings or of responsibility for meeting all requirements of the construction and Contract documents.
- .5 Adjustments made on shop drawings by Departmental Representative are not intended to change Contract Price. If adjustments affect value of Work, state such in writing to Departmental Representative prior to proceeding with ordering materials or Work.
- .6 Make changes in shop drawings by Departmental Representative may require, consistent with Contract Documents. When resubmitting, notify Departmental Representative in writing of revisions other than those requested. All revisions to be clearly clouded.
- .7 Without restricting the generality of the foregoing, the Contractor is responsible for:
  - .1 Dimensions to be confirmed and correlated at the job site.
  - .2 Information that pertains solely to fabrication processes or to techniques of construction and installation.
  - .3 Coordination of the work and all sub-trades.
- .8 If upon review by Departmental Representative, no errors or omissions are discovered or if only minor corrections are made, electronic copy will be returned and ordering, fabrication and installation of Work may proceed. If shop drawings are rejected, noted copy will be returned and resubmission of corrected shop drawings with bubbled changes, through same procedure indicated above, must be performed before fabrication and installation of Work may proceed.
- .9 Shop drawings to incorporate applicable key plan, plan, elevations and details for all work submitted. No materials to be ordered and no work to be fabricated shall be undertaken until shop drawings and other related submittals are reviewed.

**1.07 PRODUCT DATA**

- .1 Product data: manufacturers' catalogue sheets, MSDS sheets, brochures, literature, performance charts and diagrams, used to illustrate standard manufactured products or any other specified information.
- .2 Delete information not applicable to project.
- .3 Supplement standard information to provide details applicable to project.
- .4 Cross-reference product data information to applicable portions of Contract documents.
- .5 Submit electronic copies of product data.



**1.08 SAMPLES**

- .1 Submit for review samples in duplicate as requested in individual technical specification Sections. Label samples with origin and intended use. One sample will be returned with Shop Drawing Review.
- .2 Notify Departmental Representative in writing, at time of submission of deviations in samples from requirements of Contract Documents.
- .3 Where colour, pattern or texture is criterion, submit full range of samples.
- .4 Adjustments made on samples by Departmental Representative are not intended to change Contract Price. If adjustments affect value of Work, state such in writing to Departmental Representative prior to ordering materials or proceeding with Work.
- .5 Make changes in samples which Departmental Representative may require, consistent with Contract Documents.

**1.09 MOCK-UPS**

- .1 Erect mock-ups where directed by Departmental Representative and in accordance with Section 01 45 00 - Quality Control. Upon acceptance by Departmental Representative, mock-up may remain.

**1.10 PROGRESS SCHEDULE**

- .1 Submit work schedule and cost breakdown in accordance with Section 01 11 55 – General Instructions.

**1.11 INSPECTION REPORTS**

- .1 Submit in electronic test results and inspection reports where indicated.

**1.12 PHOTOGRAPHIC DOCUMENTATION**

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

**1.13 CERTIFICATES AND TRANSCRIPTS**

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

**2 PRODUCTS**

**2.01 NOT USED**

.1 Not Used.

**3 EXECUTION**

**3.01 NOT USED**

.1 Not Used.

**END OF SECTION**

**1. References**

- .1 Government of Canada.
  - .1 Canada Labour Code - Part II
  - .2 Canada Occupational Health and Safety Regulations.
- .2 National Building Code of Canada (NBC):
  - .1 Part 8, Safety Measures at Construction and Demolition Sites.
- .3 The Canadian Electric Code (as amended)
- .4 Canadian Standards Association (CSA) as amended:
  - .1 CSA Z797-2009 Code of Practice for Access Scaffold
  - .2 CSA S269.1-1975 (R2003) Falsework for Construction Purposes
  - .3 CSA S350-M1980 (R2003) Code of Practice for Safety in Demolition of Structures
  - .4 CSA Z1006-10 Management of Work in Confined Spaces.
  - .5 CSA Z462- Workplace Electrical Safety Standard
- .5 National Fire Code of Canada 2015 (as amended)
  - .1 Part 5 – Hazardous Processes and Operations and Division B as applicable and required.
- .6 American National Standards Institute (ANSI):
  - .1 ANSI A10.3, Operations – Safety Requirements for Powder-Actuated Fastening Systems.
- .7 Province of British Columbia:
  - .1 Workers Compensation Act Part 3-Occupational Health and Safety.
  - .2 Occupational Health and Safety Regulations

**2. Workers' Compensation Board Coverage**

- .1 Comply fully with the Workers' Compensation Act, regulations and orders made pursuant thereto, and any amendments up to the completion of the work.
- .2 Maintain Workers' Compensation Board coverage during the term of the Contract, until and including the date that the Certificate of Final Completion is issued.

**3. Compliance with Regulations**

- .1 PSPC may terminate the Contract without liability to PSPC where the Contractor, in the opinion of PWGSC, refuses to comply with a requirement of the Workers' Compensation Act or the Occupational Health and Safety Regulations.
- .2 It is the Contractor's responsibility to ensure that all workers are qualified, competent and certified to perform the work as required by the Workers' Compensation Act or the Occupational Health and Safety Regulations.

#### **4. Submittals**

- .1 Submit to Departmental Representative submittals listed for review in accordance with Section 01 33 00.
- .2 Work effected by submittal shall not proceed until review is complete.
- .3 Submit the following:
  - .1 Site Specific Health and Safety Plan.
  - .2 Copies of reports or directions issued by Federal and Provincial health and safety inspectors.
  - .3 Copies of incident and accident reports.
  - .4 Complete set of current Material Safety Data Sheets (MSDS), and all other documentation required by Workplace Hazardous Materials Information System (WHMIS) requirements.
  - .5 Emergency Procedures.
- .4 The Departmental Representative will review the Contractor's Site Specific Health and Safety Plan and emergency procedures, and provide comments to the Contractor within 5 days after receipt of the plan. Revise the plan as appropriate and resubmit to Departmental Representative.
- .5 Medical surveillance: where prescribed by legislation, regulation or safety program; submit certification of medical surveillance for site personnel prior to commencement of work, and submit additional certifications for any new site personnel to Departmental Representative.
- .6 Submission of the Site Specific Health and Safety Plan, and any revised version, to the Departmental Representative is for information and reference purposes only. It shall not:
  - .1 Be construed to imply approval by the Departmental Representative.
  - .2 Be interpreted as a warranty of being complete, accurate and legislatively compliant.
  - .3 Relieve the Contractor of his legal obligations for the provision of health and safety on the project.

#### **5. Responsibility**

- .1 Assume responsibility as the Prime Contractor for work under this contract.
- .2 Be responsible for health and safety of persons on site, safety of property on site and for protection of persons adjacent to site and environment to extent that they may be affected by conduct of Work.
- .3 Comply with and enforce compliance by employees with safety requirements of Contract documents, applicable Federal, Provincial, Territorial and local statutes, regulations, and ordinances, and with Site Specific Health and Safety Plan.

**6. Health and Safety Coordinator**

- .1 The Health and Safety Coordinator:
  - .1 Be responsible for completing all health and safety training and ensuring that personnel that do not successfully complete the required training are not permitted to enter the site to perform work.
  - .2 Be responsible for implementing, revising, daily enforcing, and monitoring the Site Specific Health and Safety Plan.
  - .3 Be on site during execution of work.

**7. General Conditions**

- .1 Provide safety barricades and lights around work site as required to provide a safe working environment for workers and protection for pedestrian and vehicular traffic.
- .2 Ensure that non-authorized persons are not allowed to circulate in designated construction areas of the work site.
  - .1 Provide appropriate means by use of barricades, fences, warning signs, traffic control personnel, and temporary lighting as required.
  - .2 Secure site at night time [or provide security guard] as deemed necessary to protect site against entry.

**8. Project/Site Conditions**

- .1 Work at site will involve contact with:
  - .1 Multi-employer work site.
  - .2 Federal employees and general public.
  - .3 Work at heights
  - .4 Adverse weather conditions
  - .5 Earthquake
  - .6 Tsunami
  - .7 Work with hazardous materials (See Hazard Building Materials Assessment; Appendix 1)

**9. Utility Clearances**

- .1 The Contractor is solely responsible for all utility detection and clearances prior to starting the work
- .2 The Contractor will not rely solely upon the Reference Drawings or other information provided for utility locations.

**10. Regulatory Requirements**

- .1 Comply with specified codes, acts, bylaws, standards and regulations to ensure safe operations at site.
- .2 In event of conflict between any provision of the above authorities, the most stringent provision will apply. Should a dispute arise in determining the most stringent requirement, the Departmental Representative will advise on the course of action to be followed.

- 11. Work Permits** .1 Obtain specialty permits related to project before start of work.
  
- 12. Filing of Notice**
  - .1 The General Contractor is to complete and submit a Notice of Project as required by Provincial authorities.
  - .2 Provide copies of all notices to the Departmental Representative.
  
- 13. Health and Safety Plan** .1 Conduct a site-specific hazard assessment based on review of Contract documents, required work, and project site. Identify any known and potential health risks and safety hazards.
  - .2 Prepare and comply with a site-specific project Health and Safety Plan based on hazard assessment, including, but not limited to, the following:
    - .1 Primary requirements:
      - .1 Contractor's safety policy.
      - .2 Identification of applicable compliance obligations.
      - .3 Definition of responsibilities for project safety/organization chart for project.
      - .4 General safety rules for project.
      - .5 Job-specific safe work procedures.
      - .6 Inspection policy and procedures.
      - .7 Incident reporting and investigation policy and procedures.
      - .8 Occupational Health and Safety Committee/Representative procedures.
      - .9 Occupational Health and Safety meetings.
      - .10 Occupational Health and Safety communications and record keeping procedures.
    - .2 Summary of health risks and safety hazards resulting from analysis of hazard assessment, with respect to site tasks and operations which must be performed as part of the work.
    - .3 List hazardous materials to be brought on site as required by work.
    - .4 Indicate Engineering and administrative control measures to be implemented at the site for managing identified risks and hazards.
    - .5 Identify personal protective equipment (PPE) to be used by workers.
    - .6 Identify personnel and alternates responsible for site safety and health.
    - .7 Identify personnel training requirements and training plan, including site orientation for new workers.

- .3 Develop the plan in collaboration with all subcontractors. Ensure that work/activities of subcontractors are included in the hazard assessment and are reflected in the plan.
- .4 Revise and update Health and Safety Plan as required, and re-submit to the Departmental Representative.
- .5 Departmental Representative's review: the review of Site Specific Health and Safety Plan by Public Service and Procurement Canada (PSPC) shall not relieve the Contractor of responsibility for errors or omissions in final Site Specific Health and Safety Plan or of responsibility for meeting all requirements of construction and Contract documents.

**14. Emergency Procedures**

- .1 List standard operating procedures and measures to be taken in emergency situations. Include an evacuation plan and emergency contacts (i.e. names/telephone numbers) of:
  - .1 Designated personnel from own company.
  - .2 Regulatory agencies applicable to work and as per legislated regulations.
  - .3 Local emergency resources.
  - .4 Departmental Representative
- .2 Include the following provisions in the emergency procedures:
  - .1 Notify workers and the first-aid attendant, of the nature and location of the emergency.
  - .2 Evacuate all workers safely.
  - .3 Check and confirm the safe evacuation of all workers.
  - .4 Notify the fire department or other emergency responders.
  - .5 Notify adjacent workplaces or residences which may be affected if the risk extends beyond the workplace.
  - .6 Notify Departmental Representative
- .3 Provide written rescue/evacuation procedures as required for, but not limited to:
  - .1 Work at high angles.
  - .2 Work in confined spaces or where there is a risk of entrapment.
  - .3 Work with hazardous substances.
  - .4 Underground work.
  - .5 Work on, over, under and adjacent to water.
  - .6 Workplaces where there are persons who require physical assistance to be moved.
- .4 Design and mark emergency exit routes to provide quick and unimpeded exit.

**15. Hazardous Products**

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

Canada Labour Code.

- .2 Where use of hazardous and toxic products cannot be avoided:
  - .1 Advise Departmental Representative beforehand of the product(s) intended for use. Submit applicable MSDS and WHMIS documents as per Section 01 33 00.
  - .2 In conjunction with Departmental Representative, schedule to carry out work during "off hours" when tenants have left the building.
  - .3 Provide adequate means of ventilation in accordance with Section 01 51 00.
  - .4 The contractor shall ensure that the product is applied as per manufacturers recommendations.
  - .5 The contractor shall ensure that only pre-approved products are brought onto the work site in an adequate quantity to complete the work.

**16. Asbestos Hazard**

- .1 Carry out any activities involving asbestos in accordance with applicable Provincial Regulations.
- .2 Removal and handling of asbestos will be performed as indicated in Sections 02 41 19.

**17. PCB Removals**

- .1 Mercury-containing fluorescent tubes and ballasts which contain polychlorinated biphenyls (PCBs) are classified as hazardous waste.
- .2 Remove, handle, transport and dispose of in accordance with applicable Provincial Regulations.

**18. Removal of Lead-Containing Paints**

- .1 All paints containing TCLP lead concentrations above 5 ppm are classified as hazardous.
- .2 Carry out demolition and/or remediation activities involving lead-containing paints in accordance with applicable Provincial Regulations.

**19. Electrical Safety Requirements**

- .1 Comply with authorities and ensure that, when installing new facilities or modifying existing facilities, all electrical personnel are completely familiar with existing and new electrical circuits and equipment and their operation.
  - .1 Before undertaking any work, coordinate required energizing and de-energizing of new and existing circuits with Departmental Representative.
  - .2 Maintain electrical safety procedures and take necessary precautions to ensure safety of all personnel working under this Contract, as well as safety of other personnel on site.



- 20. Electrical Lockout**
- .1 Develop, implement and enforce use of established procedures to provide electrical lockout and to ensure the health and safety of workers for every event where work must be done on any electrical circuit or facility.
  - .2 Prepare the lockout procedures in writing, listing step-by-step processes to be followed by workers, including how to prepare and issue the request/authorization form. Have procedures available for review upon request by the Departmental Representative.
  - .3 Keep the documents and lockout tags at the site and list in a log book for the full duration of the Contract. Upon request, make such data available for viewing by Departmental Representative or by any authorized safety representative.
- 21. Overloading**
- .1 Ensure no part of work is subjected to a load which will endanger its safety or will cause permanent deformation.
- 22. Falsework**
- .1 Design and construct falsework in accordance with CSA S269.1-1975 (R2003).
- 23. Scaffolding**
- .1 Design, construct and maintain scaffolding in a rigid, secure and safe manner, in accordance with CSA Z797-2009 and B.C. Occupational Health and Safety Regulations.
- 24. Confined Spaces**
- .1 Carry out work in confined spaces in compliance with Provincial Regulations
- 25. Powder-Actuated Devices**
- .1 Use powder-actuated devices in accordance with ANSI A10.3 only after receipt of written permission from the Departmental Representative.
- 26. Fire Safety and Hot Work**
- .1 Obtain Departmental Representative's authorization before any welding, cutting or any other hot work operations can be carried out on site.
  - .2 Hot work includes cutting/melting with use of torch, flame heating roofing kettles, or other open flame devices and grinding with equipment which produces sparks.
- 27. Fire Safety Requirements**
- .1 Store oily/paint-soaked rags, waste products, empty containers and materials subject to spontaneous combustion in ULC approved, sealed containers and remove from site on a daily basis.
  - .2 Handle, store, use and dispose of flammable and combustible materials in accordance with the National Fire Code of Canada.
  - .3 Portable gas and diesel fuel tanks are not permitted on most federal work sites. Approval from the DR is required prior to any gas or diesel tank being brought onto the work site.

**28. Fire Protection and Alarm System**

- .1 Fire protection and alarm systems shall not be:
- .1 Obstructed.
  - .2 Shut off.
  - .3 Left inactive at the end of a working day or shift.
- .2 Do not use fire hydrants, standpipes and hose systems for purposes other than firefighting.
- .3 Be responsible/liable for costs incurred from the fire department, the building owner and the tenants, resulting from false alarms.

**29. Unforeseen Hazards**

- .1 Should any unforeseen or peculiar safety-related factor, hazard or condition become evident during performance of the work, immediately stop work and advise the Departmental Representative verbally and in writing.

**30. Posted Documents**

- .1 Post legible versions of the following documents on site:
- .1 Site Specific Health and Safety Plan.
  - .2 Sequence of work.
  - .3 Emergency procedures.
  - .4 Site drawing showing project layout, locations of the first-aid station, evacuation route and marshalling station, and the emergency transportation provisions.
  - .5 Notice of Project.
  - .6 Floor plans or site plans.
  - .7 Notice as to where a copy of the Workers' Compensation Act and Regulations are available on the work site for review by employees and workers.
  - .8 Workplace Hazardous Materials Information System (WHMIS) documents.
  - .9 Material Safety Data Sheets (MSDS).
  - .10 List of names of Joint Health and Safety Committee members, or Health and Safety Representative, as applicable.
- .2 Post all Material Safety Data Sheets (MSDS) on site, in a common area, visible to all workers and in locations accessible to tenants when work of this Contract includes construction activities adjacent to occupied areas.
- .3 Postings should be protected from the weather, and visible from the street or the exterior of the principal construction site shelter provided for workers and equipment, or as approved by the Departmental Representative.

**31. Meetings**

- .1 **Attend health and safety pre-construction meeting and all subsequent meetings called by the Departmental Representative.**

**32. Correction of Non-Compliance**

- .1 Immediately address health and safety non-compliance issues identified by the Departmental Representative.

- .2 Provide Departmental Representative with written report of action taken to correct non-compliance with health and safety issues identified.
- .3 The Departmental Representative may issue a "stop work order" if non-compliance of health and safety regulations is not corrected immediately or within posted time. The General Contractor/subcontractors will be responsible for any costs arising from such a "stop work order".

**END OF SECTION**



**1 GENERAL**

**1.01 RELATED SECTIONS**

- .1 Section 02 41 19 – Selective Structure Demolition.
- .2 Section 09 91 00 – Painting.

**1.02 REFERENCES**

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

**1.03 ADMINISTRATIVE REQUIREMENTS**

- .1 Convene start-up meeting prior to beginning work with contractor's representative and Departmental Representative to:
  - 1. Verify Environmental Protection Plan and conformance requirements to municipal, provincial and federal regulations.

**1.04 ACTION AND INFORMATIONAL SUBMITTALS**

- .1 Provide submittals in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Prior to commencing construction activities or delivery of materials to site, provide Environmental Protection Plan for review and approval by Departmental Representative.
- .3 Ensure Environmental Protection Plan includes comprehensive overview of known or potential environmental issues to be addressed during construction.
- .4 Address topics at level of detail commensurate with environmental issue and required construction tasks.
- .5 Include in Environmental Protection Plan:
  - .1 Names of persons responsible for ensuring adherence to Environmental Protection Plan.
  - .2 Names and qualifications of persons responsible for manifesting hazardous waste to be removed from site.
  - .3 Names and qualifications of persons responsible for training site personnel.
  - .4 Descriptions of environmental protection personnel training program.
  - .5 Drawings showing locations of proposed temporary scaffolding over water crossings, material storage areas, structures, and stockpiles of excess or spoil

- .6 materials including methods to control runoff and to contain materials on site.  
Work area plan showing proposed activity in each portion of area and identifying areas of limited use or non-use. Ensure plan includes measures for marking limits of use areas and methods for protection of features to be preserved within authorized work areas.
- .7 Pollution Control Plan:
  - .1 Including procedures, instructions, and reports to be used in event of unforeseen spill of regulated substance.
  - .2 Identifying potentially hazardous substances to be used on job site; intended actions to prevent introduction of such materials into air, water, or ground; and detailing provisions for compliance with Federal, Provincial, and Municipal laws and regulations for storage and handling of these materials.
  - .3 Non-Hazardous solid waste disposal plan identifying methods and locations for solid waste disposal including clearing debris.
  - .4 Air pollution control plan detailing provisions to assure that dust, paint overspray, debris, materials, and trash, are contained on project site.
  - .5 Name of individual who will be responsible for implementing and supervising the spill containment and cleanup.
  - .6 Training requirements for Contractor's personnel and methods of accomplishing the training.
- .8 Historical, archaeological, cultural resources biological resources and wetlands plan that defines procedures for identifying and protecting historical, archaeological, cultural resources, biological resources and wetlands.

**1.05 FIRES**

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

**1.06 DRAINAGE**

- .1 Do not allow water containing suspended materials to into waterways, sewer or drainage systems.
- .2 Control disposal or runoff of water containing suspended materials or other harmful substances in accordance with local authority requirements.

**1.07 WORK ADJACENT TO WATERWAYS**

- .1 Construction equipment to be operated on land only.
- .2 Do not use waterway beds.
- .3 Waterways to be free of excavated fill, waste material and debris.
- .4 Design and construct temporary crossings to minimize erosion to waterways.
- .5 Do not skid construction materials across waterways.

**1.08 POLLUTION CONTROL**

- .1 Contractor and sub trade personnel must develop and maintain spill response and reporting procedures including containment methods.

- .2 In the event of a spill, Contractor shall immediately contain and assess the spill, provide appropriate notifications and take the necessary steps to prevent further discharge. Notifications shall include contacting the Provincial Emergency Program at 1-800-663-3456 and the Departmental Representative.
- .3 The Contractor must have spill containment kits ready for immediate deployment, containing sufficient quantities of absorbent materials on site in close proximity to work area including working machinery and equipment such as fuel portable generator, air compressors, hoist and tools.
- .4 The Contractor is to have personnel on site that are trained and ready to use spill containment kits. Ensure proper disposal procedures in accordance with all applicable provincial and municipal regulations. Fires and burning of rubbish on site is not permitted.
- .5 Contractor is responsible for immediate clean up of the spill and restoration of the area to the satisfaction of the Departmental Representative and other regulatory agencies, where involved.
- .6 Ensure all equipment used on site is clean and free from contaminants. Materials and equipment shall be regularly inspected, maintained, operated and stored in a manner that prevents deleterious substances (eg. Petroleum products, silt, etc.) from entering watercourse.
- .7 Ensure proper procedures in accordance with all applicable provincial regulations.
- .8 Ensure removed paint, debris and paint overspray does not fall into the Fraser River under the Cannery Pier in accordance with applicable legislation.
- .9 Control emissions from equipment to local authorities' emission requirements.
- .10 Prevent extraneous materials from contaminating air and waterways beyond application area. Provide temporary enclosures.

#### **1.09 NOTIFICATION**

- .1 Departmental Representative will notify Contractor in writing of observed noncompliance with Federal, Provincial or Municipal environmental laws or regulations.
- .2 Contractor: after receipt of such notice, inform Departmental Representative of proposed corrective action and take such action for approval by Departmental Representative.
  - .1 Do not take action until after receipt of written approval by Departmental Representative.
- .3 Departmental Representative will issue stop order of work until satisfactory corrective action has been taken.
- .4 No time extensions granted or equitable adjustments allowed to Contractor for such suspensions.

#### **2 PRODUCTS**

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

- .1 Not Used.

**3 EXECUTION**

**3.01 CLEANING**

- .1 Clean in accordance with Section 01 74 11 - Cleaning.
- .2 Waste Management: separate waste materials and recycle or deposit at authority approved facilities.
- .3 Ensure public waterways, storm and sanitary sewers remain free of waste and volatile materials disposal.

**END OF SECTION**



**1 GENERAL**

**1.01 REFERENCES AND CODES**

- .1 Perform Work in accordance with National Building Code of Canada (NBC), 2015 including amendments up to tender closing date and other codes of provincial or local application provided that in case of conflict or discrepancy, more stringent requirements apply.
- .2 Perform Work in accordance with WorkSafe BC current requirements and standards.
- .3 Meet or exceed requirements of:
  - .1 Contract documents.
  - .2 Specified standards, codes and referenced documents.

**1.02 HAZARDOUS MATERIAL DISCOVERY**

- .1 Lead-containing Paint present. Take appropriate precautions.
- .2 Asbestos-containing Materials present. Take appropriate precautions.
- .3 PCB: Polychlorinated Biphenyl: may be present. Take appropriate precautions.
- .4 Mould: stop work immediately when material resembling mould is encountered during demolition work. Notify Departmental Representative.

**1.03 BUILDING SMOKING ENVIRONMENT**

- .1 Comply with smoking restrictions and municipal by-laws.

**2 PRODUCTS**

**2.01 NOT USED**

- .1 Not Used.

**3 EXECUTION**

**3.01 NOT USED**

- .1 Not Used.

**END OF SECTION**



**1 GENERAL**

**1.01 RELATED REQUIREMENTS**

- .1 Section 03 30 53 – Miscellaneous Cast-In-Place Concrete.
- .2 Section 05 50 00 – Metal Fabrications.
- .3 Section 05 73 00 – Aluminum Guardrails.
- .4 Section 06 05 73 – Wood Treatment.
- .5 Section 06 10 00 – Rough Carpentry.
- .6 Section 07 21 00 – Thermal Insulation.
- .7 Section 07 25 00 – Weather Barriers.
- .8 Section 07 27 13 – Modified Bituminous Sheet Air Barriers.
- .9 Section 07 42 13 – Composite Metal Panels.
- .10 Section 07 52 16 – Conventional SBS Roofing Combustible Substrates.
- .11 Section 07 92 00 – Joint Sealants.
- .12 Section 08 53 13 – Plastic Windows and Doors.
- .13 Section 09 90 00 – Painting and Coating.

**1.02 INSPECTION**

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

**1.03 INDEPENDENT INSPECTION AGENCIES**

- .1 Independent Inspection/Testing Agencies will be engaged by Contractor for purpose of inspecting and/or testing portions of Work. Cost of such services will be borne by the Contractor.

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

#### **1.04 ACCESS TO WORK**

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

#### **1.05 PROCEDURES**

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

#### **1.06 REJECTED WORK**

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

#### **1.07 REPORTS**

- .1 Submit two (2) copies of inspection and test reports to Departmental Representative.
- .2 Provide copies to subcontractor of work being inspected or tested, manufacturer or fabricator of material being inspected or tested.

#### **1.08 TESTS AND MIX DESIGNS**

- .1 Furnish test results as requested.

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

**1.09 MOCK-UPS**

- .1 Prepare mock-ups for Work specifically requested in technical specifications. Include for Work of Sections required to provide mock-ups.
- .2 Construct in locations acceptable and as approved by Departmental Representative.
- .3 Prepare mock-ups for Departmental Representative review with reasonable promptness and in orderly sequence, to not cause delays in Work.
- .4 Failure to prepare mock-ups in ample time is not considered sufficient reason for extension of Contract Time and no claim for extension by reason of such default will be allowed.
- .5 Mock-ups, when approved may remain as part of Work.

**1.10 MILL TESTS**

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

**2 PRODUCTS**

**2.01 NOT USED**

- .1 Not Used.

**3 EXECUTION**

**3.01 NOT USED**

- .1 Not Used.

**END OF SECTION**



**1 GENERAL**

**1.01 REFERENCES**

- .1 Canadian Standards Association (CSA) as amended:
  - .1 CAN/CSA Z321-96(R2001), Signs and Symbols for the Occupational Environment.

**1.02 ACTION AND INFORMATIONAL SUBMITTALS**

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

**1.03 ACCESS AND DELIVERY**

- .1 Only designated entrance may be used for access to building. Confirm with Departmental Representative.
  - .1 Maintain for duration of Contract.
  - .2 Make good damage resulting from Contractor's use.
- .2 Use of facilities will be granted to the Contractor by reservation through the Departmental Representative.
  - .1 Limited parking is permitted as directed by Departmental Representative. Security has been instructed to have unauthorized vehicles towed at the Contractor's expense. Refer to Section 01 14 00 – Work Restrictions.

**1.04 STORAGE FACILITIES**

- .1 Storage space will be provided as directed by Departmental Representative. Refer to Section 01 14 00 – Work Restrictions.

**1.05 WATER**

- .1 Water supply is available at existing building and may be used for construction purposes at no cost.
  - .1 One hose bib is located on the east elevation of the building.

**1.06 POWER**

- .1 Electrical power and lighting at existing buildings may be used for construction purposes at no extra cost, provided that warranties are not affected thereby and electrical components used for temporary power are replaced when damaged. Do not use emergency power or UPS panels for this purpose.
  - .1 Only one power outlet is available on the exterior of the building, and is permissible for use. Contractor is responsible for supplying back-up power and/ or generators for additional capacity as required.

**1.07 HEATING AND VENTILATION**

- .1 Do not begin work until arrangements have been made with the Departmental Representative for protection of heating, ventilating and air-conditioning (temporary removal of existing exterior vents or louvres).
  - .1 If there is any dirt or dust in the heating and ventilating system, it will be the Contractor's responsibility to return to its original state in accordance with the Departmental Representative's specifications.

- .2 Prevent dust and odour migration to occupied areas.
  - .1 Do not deactivate HVAC system.

**1.08 TEMPORARY COMMUNICATION FACILITIES**

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

**1.09 SANITARY FACILITIES**

- .1 Washroom facilities are available at the free-standing public washroom building located by the main entry of the Cannery building.

**1.10 SCAFFOLDING**

- .1 Construct and maintain scaffolding in rigid, secure and safe manner in accordance with Section 01-52 00 – Construction Facilities and WorkSafe BC requirements.
- .2 Scaffolding to be erected independent of walls where possible. Remove promptly when no longer required. Remove fastenings from structure, if used and patch, sand and paint to match.

**1.11 REMOVAL OF TEMPORARY FACILITIES**

- .1 Remove temporary facilities from site when directed by the Departmental Representative.

**1.12 SIGNS AND NOTICES**

- .1 Signs and notices for safety and instruction are permitted and shall be in both official languages or graphic symbols conforming to CAN/CSA-Z321.
- .2 Maintain approved signs and notices in good condition for duration of project, and dispose of off-site on completion of project or when directed by Departmental Representative.

**2 PRODUCTS**

**2.01 NOT USED**

- .1 Not Used.

**3 EXECUTION**

**3.01 NOT USED.**

- .1 Not Used.

**END OF SECTION**



**1 GENERAL**

**1.01 REFERENCES**

- .1 Canadian Standards Association (CSA International)
  - .1 CAN/CSA-Z271-10, Safety Code for Suspended Platforms.
  - .2 CAN/CSA-Z321-96(R2001), Signs and Symbols for the Occupational Environment.

**1.02 ACTION AND INFORMATIONAL SUBMITTALS**

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

**1.03 INSTALLATION AND REMOVAL**

- .1 Prepare site plan indicating proposed location and dimensions of area to be fenced and used by Contractor, number of trailers to be used, avenues of ingress/egress to fenced area and details of fence installation.
- .2 Indicate use of supplemental or other staging area.
- .3 Provide construction facilities in order to execute work expeditiously.
- .4 Remove from site all such work after use.

**1.04 SCAFFOLDING**

- .1 Scaffolding in accordance with CAN/CSA- Z271.
- .2 Provide and maintain scaffolding, ladders, platforms and temporary stairs.

**1.05 BARRIERS AND ENCLOSURES**

- .1 In accordance with Section 01 55 00 – Temporary Facilities and Controls and WorkSafe BC requirements.

**1.06 SITE STORAGE/LOADING**

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

**1.07 CONSTRUCTION PARKING**

- .1 Limited parking will be permitted on site as directed by Departmental Representative. Provide for additional parking off site. Refer to 01 14 00 – Work Restrictions.
- .2 Provide and maintain adequate access to project site.

**1.08 SECURITY**

- .1 Provide and pay for responsible security personnel to guard contractor storage and laydown area after working hours and during holidays.

**1.09 OFFICES**

- .1 Provide office heated to 22 degrees C, lighted 750 lx and ventilated, of sufficient size to accommodate site meetings and furnished with drawing laydown table.
- .2 Provide marked and fully stocked first-aid case in a readily available location.

**1.10 EQUIPMENT, TOOL AND MATERIALS STORAGE**

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

**1.11 SANITARY FACILITIES**

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

**1.12 PROTECTION AND MAINTENANCE OF TRAFFIC**

- .1 Refer to Section 01 14 00 – Work Restrictions.
- .2 Provide access as necessary to maintain traffic.
- .3 Maintain and protect traffic on affected roads during construction period except as otherwise specifically directed by Departmental Representative.
- .4 Provide measures for protection and diversion of traffic, including provision of watch-persons and flag-persons, erection of barricades, placing of lights around and in front of equipment and work, and erection and maintenance of adequate warning, danger, and direction signs
- .5 Protect travelling public from damage to person and property.
- .6 Contractor's traffic on roads selected for hauling material to and from site to interfere as little as possible with public traffic.
- .7 Verify adequacy of existing roads and allowable load limit on these roads. Contractor responsible for repair of damage to roads caused by construction operations.
- .8 Provide necessary lighting, signs, barricades, and distinctive markings for safe movement of traffic.
- .9 Dust control: adequate to ensure safe operation at all times.
- .10 Provide snow removal during period of Work when required.

**1.13 CLEAN-UP**

- .1 Remove construction debris, waste materials, packaging material from work site daily.
- .2 Clean dirt or mud tracked onto paved or surfaced roadways.

- .3 Store materials resulting from demolition activities that are salvageable, where directed by Departmental Representative.
- .4 Stack stored new or salvaged material not in construction facilities.

**2 PRODUCTS**

**2.01 NOT USED**

- .1 Not Used.

**3 EXECUTION**

**3.01 NOT USED.**

- .1 Not Used.

**END OF SECTION**



## **1 GENERAL**

### **1.1 DESCRIPTION**

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- .1 Design, supply, erect and maintain fixed scaffolding as required as to facilitate rehabilitation work including all bracing, tie backs, outriggers, guardrails, toe boards, platforms, access stair and ladders.
- .2 Perform daily safety inspections during the erection of the scaffolding, and maintain the safety of the workers and pedestrians.
- .3 Perform safety inspection upon completion of the scaffold system erection but prior to use of other contractors.
- .4 Scaffolding is to extend a minimum of 4 feet (1.2 m) above existing roof parapet.
- .5 Supply and erect demolition grade garbage chutes as required.
- .6 Supply and erect access stairs.
- .7 Supply and erect electric material hoist.
- .8 Scaffold system as erected is to be fully compliant with all relevant regulations.

### **1.2 STANDARDS AND CODES**

---

- .1 CAN/CSA-S269.2-M87 "Access Scaffolding for Construction Purposes".
- .2 National Building Code of Canada.
- .3 Occupational Health and Safety Act of British Columbia.
- .4 WorkSafe BC.

## **2 PRODUCTS**

### **2.1 SCAFFOLDING COMPONENTS**

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- .1 All metal scaffolding components to be provided by a single source supplier of metal scaffolding components acceptable to the Departmental Representative.
- .2 The supplier of metal scaffolding components shall provide test data and test information upon request.

### **2.2 DESIGN**

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- .1 The scaffolding shall be designed and constructed in accordance to the requirements of the Standards and Codes referenced in Section 1.2.
- .2 When required, the scaffolding is to be enclosed with an enclosure capable of providing protection to the pedestrians and adjacent property from dust, dirt, water spray, falling tools and debris, etc.

.3 Support Conditions

- .1 Soil-bearing conditions shall be verified by the Scaffolding Contractor.
- .2 Where the existing structure is to be used for the support of the scaffolding, the Contractor must verify that the existing structure can safely support the imposed loads from the scaffolding. Should the existing structure require strengthening for support of the scaffolding, the Contractor must provide details for shoring or strengthening on the scaffolding erection drawings.
- .3 When the Contractor relies on the existing structure of the building for lateral support of the scaffolding, the Contractor takes responsibility for not only providing adequate anchorage of the lateral supports for the scaffolding, but also the responsibility to establish whether or not the existing wall framing or structure can adequately support the lateral loads from the scaffolding. Any damage to the wall / floor structure due to the anchorage of the lateral support of the scaffolding must be repaired without disfiguring the building at no cost to the Owner.

.4 Enclosure

- .1 The Contractor is responsible for taking into account wind loads that are imposed on the scaffolding as a result of the scaffolding being enclosed.
- .2 It is intended that tarping, shrink-wrap and/or scafnet be fixed to the scaffolding and the scaffolding anchorage designed to resist all wind loads. For design purposes, assume that the scaffold will be fully enclosed with shrink-wrap.

.5 Access to Scaffolding

- .1 Access to scaffolding is to be by stairs. All stairs are to have handrails and all landings to have railings such that if a worker trips and falls while descending the stairs, it will not be possible for the worker to fall through the railing system.
- .2 All stair openings on planked working areas of the scaffolding to be surrounded by railings to prevent workers from walking into the back or the sides of the open stair.

.6 Working Platforms

- .1 All levels of the scaffolding are to be fully planked.
- .2 Levels of the scaffolding designated for work must be fully planked. On a designated working platform, Contractors are not to remove isolated areas of planking such that the fully planked platform has areas of missing planks.
- .3 If a Contractor deems that fully planked working platforms are not required, or a partially planked platform is required to facilitate lowering or raising material, guardrails must be installed to prevent a worker from falling off the partially planked platform.
- .4 With the exception of the front of stair openings, all openings in working platforms to have railings to prevent workers from accidentally walking into the openings.

### 3 EXECUTION

#### 3.1 PROFESSIONAL ENGINEER'S CERTIFICATION

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- .1 The Contractor will retain and pay for all costs associated with the engineering of the scaffolding system including inspections and verification of revision and/or modifications.
- .2 After the scaffolding is erected, the Contractor must provide written certification from a Scaffolding Design Engineer that the scaffolding is erected in accordance with the reviewed erection drawings. The engineer is to be registered in the Province of BC

#### 3.2 DISCLOSURE OF ORDERS TO COMPLY AND WCB INSPECTION REPORTS

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- .1 Any inspection reports, orders to comply, etc., issued to the Contractor by the representative of WorkSafe BC, or any authority having jurisdiction, are to be provided to the Departmental Representative and the Scaffolding Engineer responsible for certifying the scaffolding erection drawings and confirming that the scaffolding is erected in accordance with the reviewed erection drawings.
- .2 Any life safety instructions / work orders by WorkSafe BC are to be immediately followed by the Contractor prior to continuing with the Work.
- .3 At all times compliance with WorkSafe BC regulations will be considered a contractual requirement on the behalf of the Contractor.

#### 3.3 EXISTING STRUCTURE

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- .1 The Contractor must verify that the existing structure can safely support all loads imposed by the scaffolding.
- .2 The Contractor will be responsible for all damage to the existing building, caused by the erection / dismantling of the scaffolding and by loads imposed by the scaffolding.

#### 3.4 FABRICATION AND INSTALLATION OF HOARDING SCAFFOLDING

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- .1 All hoarding is to be installed in accordance with the rules and regulations as required by applicable regulations and in accordance with the referenced standards contained in Section 1.2.
- .2 Install hoarding protection as required to facilitate rehabilitation work.
- .3 Provide posts, rafters, planking and plywood sheathing.

- .4 The roof structure of the hoarding is to be constructed of wood framing capable of withstanding impact load from falling debris, materials or tools in order to provide overhead protection to public accessing the building during construction.
- .5 The roof of all hoarding must also be waterproof with peel and stick membrane.

### 3.5 MAINTENANCE OF HOARDING

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- .1 If necessary the Contractor will provide sufficient lighting for evening entrance and exit of the building throughout covered walkways.
- .2 The Contractor will maintain hoarding in good condition at all times.

### 3.6 DUST TIGHT SCREENS

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- .1 Provide dust tight screens or partitions to localize dust generating activities, and for protection of workers, finished areas of Work and public.
- .2 Protect work areas, equipment, and Owner possessions during interior work such as ceiling demolition, drywall repair, and painting.
- .3 Identify any items, including equipment or furniture, which will prevent the timely performance of the interior work.
- .4 Contractor to provide minimum one (1) week advanced notice for removal or relocation of equipment or furniture that will interfere with interior work. Owner will arrange for relocation of their possessions.
- .5 Maintain and relocate protection until such work is complete.

### 3.7 ACCESS TO SITE

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- .1 Provide and maintain access roads, sidewalk crossings as may be required for access to Work.
- .2 Provide and maintain barricades as required to perform Work and protect public.
- .3 Maintain access to property including overhead clearances for use by emergency response vehicles.

END OF SECTION



**1 GENERAL**

**1.01 RELATED REQUIREMENTS**

- .1 Section 03 30 53 – Miscellaneous Cast-In-Place Concrete.
- .2 Section 05 50 00 – Metal Fabrications.
- .3 Section 05 73 00 – Aluminum Guardrails.
- .4 Section 06 05 73 – Wood Treatment.
- .5 Section 06 10 00 – Rough Carpentry.
- .6 Section 07 21 00 – Thermal Insulation.
- .7 Section 07 25 00 – Weather Barriers.
- .8 Section 07 27 13 – Modified Bituminous Sheet Air Barriers.
- .9 Section 07 42 13 – Composite Metal Panels.
- .10 Section 07 52 16 – Conventional SBS Roofing Combustible Substrates.
- .11 Section 07 92 00 – Joint Sealants.
- .12 Section 08 53 13 – Plastic Windows and Doors.
- .13 Section 09 90 00 – Painting and Coating.

**1.02 REFERENCES**

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

**1.03 PRODUCTS, MATERIALS AND EQUIPMENT**

- .1 Products, materials, equipment and articles incorporated in Work shall be NEW, not damaged or defective, and of best quality for purpose intended and compatible with the specifications. If requested, furnish evidence as to type, source and quality of products provided.
- .2 Use products of one (1) manufacturer for material and equipment of the same type or classification unless otherwise specified.

- .3 Unless otherwise specified, comply with manufacturer's latest printed instructions for materials and installation methods.
- .4 Notify Departmental Representative in writing of any conflict between these specifications and manufacturer's instructions. Departmental Representative will designate which document is to be followed.

#### **1.04 AVAILABILITY**

- .1 Immediately upon signing Contract, review product delivery requirements and anticipate foreseeable supply delays for items.
- .2 If delays in supply of products are foreseeable, notify Departmental Representative of such, in order that substitutions or other remedial action may be authorized in ample time to prevent delay in performance of Work.
- .3 In event of failure to notify Departmental Representative at commencement of Work and should it subsequently appear that Work may be delayed for such reason, the Departmental Representative reserves right to substitute more readily available products of similar character, at no increase in Contract Price or Contract Time.

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

- .1 Handle and store products in manner to prevent damage, adulteration, deterioration and soiling and in accordance with manufacturer's instructions when applicable.
- .2 Store packaged or bundled products in original and undamaged condition with manufacturer's seal and labels intact. Do not remove from packaging or bundling until required in Work.
- .3 Store products subject to damage from weather in weatherproof enclosures.
- .4 Store sheet materials on flat, solid supports and keep clear of ground. Slope to shed moisture.
- .5 Remove and replace damaged products at own expense and to satisfaction of Departmental Representative.

#### **1.06 TRANSPORTATION**

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

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

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

**1.08 QUALITY OF WORK**

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

**1.09 CO-ORDINATION**

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

**1.10 REMEDIAL WORK**

- .1 Refer to Section 01 73 00 – Execution.
- .2 Perform remedial work required to repair or replace parts or portions of Work identified as defective or unacceptable. Co-ordinate adjacent affected Work as required.
- .3 Perform remedial work by specialists familiar with materials affected. Perform in a manner to neither damage nor put at risk any portion of Work.

**1.11 FASTENINGS**

- .1 Use fastenings of standard commercial sizes and patterns with material and finish suitable for service.
- .2 Provide metal fastenings and accessories in the same texture, colour and finish as base metal in which they occur.
  - .1 Prevent electrolytic action between dissimilar metals.
  - .2 Use non-corrosive fasteners, anchors and spacers for securing exterior work unless stainless steel or other material is specifically requested in technical specification sections.
  - .3 Use heavy hexagon heads, semi-finished unless otherwise specified.
  - .4 Bolts may not project more than 1 diameter beyond bolts.
- .3 Types of washers as follows:
  - .1 Soft neoprene washers: use for exposed fastening of exterior metal panels.
- .4 Deliver, store and maintain packaged material and equipment with manufacturer's seals and labels intact.
- .5 Prevent damage, adulteration and soiling of products during delivery, handling and storage. Immediately remove rejected products from site.
- .6 Store products in accordance with suppliers' instructions.

- .7 Touch up damaged factory finished surfaces according to manufacturer's recommendations and to Departmental Representative's satisfaction.
  - .1 Use primer or enamel to match original.
  - .2 Do not paint over nameplates.
- .8 Space anchors within individual load limit or shear capacity and ensure they provide positive permanent anchorage. Wood, or any other organic material plugs are not acceptable.
- .9 Keep exposed fastenings to a minimum, space evenly and install neatly.
- .10 Fastenings which cause spalling or cracking of material to which anchorage is made are not acceptable.

#### **1.12 PROTECTION OF EXISTING BUILDING AND WORK IN PROGRESS**

- .1 Protect existing building components and finishes (including glazing, roof finishes, ramps, guardrails, stairways and areas not included in scope of work) from damage. Repair damaged components and finishes according to Departmental Representative's specifications, to better condition.
- .2 Prevent overloading of parts of building. Do not cut, drill or sleeve load bearing structural member, unless specifically indicated without written approval of Departmental Representative.

#### **1.13 CONTRACTOR'S OPTIONS FOR SELECTION OF PRODUCTS FOR TENDERING**

- .1 Products are specified by 'Prescriptive' specifications: select any product meeting or exceeding specifications.
- .2 Products specified under "Acceptable Products": select any one of the indicated manufacturers or any other manufacturer meeting or exceeding the Prescriptive specifications and indicated Products.
- .3 Products specified by performance and referenced standard: select any product meeting or exceeding the referenced standard.
- .4 Products specified to meet particular design requirements or to match existing materials: use only material specified Acceptable Product. Alternative products may be considered provided full technical data is received in writing by Departmental Representative in accordance with Section 01 11 55 – General Instructions.
- .5 When products are specified by a referenced standard or by or performance specifications, upon request of Departmental Representative obtain from manufacturer an independent laboratory report showing that the product meets or exceeds the specified requirements at no cost to Departmental Representative.
- .6 Provide cost saving breakout in bid form for alternate material or system if incorporated.
- .7 Amounts of all credits arising from approval of the substitutions will be determined by the Departmental Representative and the Contract price will be reduced accordingly.

**2 PRODUCTS**

**2.01 NOT USED**

.1 Not Used.

**3 EXECUTION**

**3.01 NOT USED**

.1 Not Used.

**END OF SECTION**



**1 GENERAL**

**1.01 RELATED REQUIREMENTS**

- .1 Section 03 30 53 – Miscellaneous Cast-In-Place Concrete.
- .2 Section 05 50 00 – Metal Fabrications.
- .3 Section 05 73 00 – Aluminum Guardrails.
- .4 Section 06 05 73 – Wood Treatment.
- .5 Section 06 10 00 – Rough Carpentry.
- .6 Section 07 21 00 – Thermal Insulation.
- .7 Section 07 25 00 – Weather Barriers.
- .8 Section 07 27 13 – Modified Bituminous Sheet Air Barriers.
- .9 Section 07 42 13 – Composite Metal Panels.
- .10 Section 07 52 16 – Conventional SBS Roofing Combustible Substrates.
- .11 Section 07 92 00 – Joint Sealants.
- .12 Section 08 53 13 – Plastic Windows and Doors.
- .13 Section 09 90 00 – Painting and Coating.

**1.02 ACTION AND INFORMATIONAL SUBMITTALS**

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

**1.03 MATERIALS**

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

**1.04 PREPARATION**

- .1 Inspect existing conditions, including elements subject to damage or movement during cutting and patching.
- .2 After uncovering, inspect conditions affecting performance of Work and review existing conditions with Departmental Representative.
- .3 Beginning of cutting or patching means acceptance of existing conditions.
- .4 Provide supports to assure structural integrity of surroundings; provide devices and methods to protect other portions of project from damage.
- .5 Provide protection from elements for areas which are to be exposed by uncovering work.

**1.05 EXECUTION**

- .1 Execute cutting, fitting, and patching to complete Work.
- .2 Fit several parts together, to integrate with other Work.
- .3 Uncover Work to install ill-timed Work.
- .4 Remove and replace defective and non-conforming Work.
- .5 Execute Work by methods to avoid damage to other Work, and which will provide proper surfaces to receive patching and finishing.
- .6 Restore work with new products in accordance with requirements of Contract Documents.
- .7 Fit Work airtight to pipes, sleeves, ducts, conduit, and other penetrations through surfaces.

**1.06 WASTE MANAGEMENT AND DISPOSAL**

- .1 Separate waste materials for reuse and recycling.

**2 PRODUCTS**

**2.01 NOT USED**

- .1 Not Used.



**3 EXECUTION**

**3.01 NOT USED**

.1 Not Used.

**END OF SECTION**



**1 GENERAL**

**1.01 PROJECT CLEANLINESS**

- .1 Maintain Work in tidy condition, free from accumulation of waste products and debris, including that caused by Owner or other Contractors.
- .2 Remove waste materials from site at daily regularly scheduled times or dispose of at municipal approved facilities. Do not burn waste materials on site.
- .3 Make arrangements with and obtain permits from authorities having jurisdiction for disposal of waste and debris.
- .4 Provide on-site containers for collection of waste materials and debris.
- .5 Provide and use marked separate bins for recycling.
- .6 Dispose of waste materials and debris off site.
- .7 Store volatile waste in covered metal containers, and remove from premises at end of each working day.
- .8 Provide adequate ventilation during use of volatile or noxious substances. Use of building ventilation systems is not permitted for this purpose.
- .9 Use only cleaning materials recommended by manufacturer of surface to be cleaned, and as recommended by cleaning material manufacturer.
- .10 Schedule cleaning operations so that resulting dust, debris and other contaminants will not contaminate building systems.

**1.02 FINAL CLEANING**

- .1 When Work is Substantially Performed remove surplus products, tools, construction machinery and equipment not required for performance of remaining Work.
- .2 Remove waste products and debris and leave Work clean and suitable for occupancy.
- .3 Prior to final review remove surplus products, tools, construction machinery and equipment.
- .4 Remove waste products and debris including that caused by Owner or other Contractors.
- .5 Vacuum clean behind grilles, louvres and screens.
- .6 Inspect finishes, fitments and equipment and ensure specified workmanship and operation.
- .7 Broom clean and wash exterior walks, steps and surfaces; where used for project Work.
- .8 Remove dirt and other disfiguration from exterior surfaces of Work.
- .9 Clean equipment and fixtures to sanitary condition; clean glazing and frames where adjacent to work.

**1.03 WASTE MANAGEMENT AND DISPOSAL**

.1 Separate waste materials for reuse and recycling.

**2 PRODUCTS**

**2.01 NOT USED**

.1 Not Used.

**3 EXECUTION**

**3.01 NOT USED**

.1 Not Used.

**END OF SECTION**

**1 GENERAL**

**1.01 RELATED REQUIREMENTS**

- .1 Refer to technical sections for waste management and disposal.

**1.02 WASTE MANAGEMENT GOALS**

- .1 Prior to start of Work, conduct meeting with Departmental Representative to review and discuss PWGSC's Waste Management Plan and Goals.

**1.03 DEFINITIONS**

- .1 Recycle: process by which waste and recyclable materials are transformed or collected for purpose of being transferred into new products.
- .2 Recycling: process of sorting, cleansing, treating and reconstituting solid waste and other discarded materials for purpose of using in altered form. Recycling does not include burning, incinerating, or thermally destroying waste.
- .3 Reuse: repeated use of product in same form but not necessarily for same purpose.  
Reuse includes:
  - .1 Salvaging reusable materials from re-modelling projects, before demolition stage, for resale, reuse on current project or for storage for use on future projects.
  - .2 Returning reusable items including pallets or unused products to vendors.
- .4 Salvage: removal of structural and non-structural materials from deconstruction/disassembly projects for purpose of reuse or recycling.

**1.04 STORAGE, HANDLING AND PROTECTION**

- .1 Handle waste materials not re-used, salvaged or recycled in accordance with appropriate regulations and codes.
- .2 Materials in separated condition: collect, handle, store on site where directed and transport off-site to an approved and authorized recycling facility.
- .3 Materials must immediately be separated into required categories for re-use or recycling.
- .4 Unless specified otherwise, materials for removal become Contractor's property.
- .5 Separate non-salvageable materials for recycling where applicable recycling facility exists. Transport and deliver non-salvageable items to licensed recycling and disposal facilities.
- .6 Protect structural components not removed for demolition from movement or damage.
- .7 Support affected structures. If safety of building is endangered, cease operations and immediately notify Departmental Representative.
- .8 Separate and store materials produced during dismantling of structures in designated areas.
- .9 Prevent contamination of materials to be salvaged and recycled and handle materials in accordance with requirements for acceptance by designated facilities.

- .1 On-site source separation is recommended.
- .2 Remove co-mingled materials to off-site processing facility for separation.

**1.05 DISPOSAL OF WASTES**

- .1 Do not bury rubbish or waste materials.
- .2 Do not dispose of waste, volatile materials, mineral spirits, oil, paint thinner into waterways, storm, or sanitary sewers.
- .3 Remove materials from deconstruction as deconstruction/disassembly Work progresses.

**1.06 USE OF SITE AND FACILITIES**

- .1 Execute work with least possible interference or disturbance to normal use of premises.
- .2 Maintain security measures as approved by Departmental Representative.

**1.07 SCHEDULING**

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

**2 PRODUCTS**

**2.01 NOT USED**

- .1 Not Used.

**3 EXECUTION**

**3.01 APPLICATION**

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

**3.02 CLEANING**

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

**END OF SECTION**

## **1 GENERAL**

### **1.01 RELATED REQUIREMENTS**

- .1 Section 03 30 53 – Miscellaneous Cast-In-Place Concrete.
- .2 Section 05 50 00 – Metal Fabrications.
- .3 Section 05 73 00 – Aluminum Guardrails.
- .4 Section 06 05 73 – Wood Treatment.
- .5 Section 06 10 00 – Rough Carpentry.
- .6 Section 07 21 00 – Thermal Insulation.
- .7 Section 07 25 00 – Weather Barriers.
- .8 Section 07 27 13 – Modified Bituminous Sheet Air Barriers.
- .9 Section 07 42 13 – Composite Metal Panels.
- .10 Section 07 52 16 – Conventional SBS Roofing Combustible Substrates.
- .11 Section 07 92 00 – Joint Sealants.
- .12 Section 08 53 13 – Plastic Windows and Doors.
- .13 Section 09 90 00 – Painting and Coating.

### **1.02 ADMINISTRATIVE REQUIREMENTS**

- .1 Acceptance of Work Procedures:
  - .1 Contractor's Inspection: Contractor: conduct inspection of Work, identify deficiencies and defects, and repair as required to conform to Contract Documents.
    - .1 Notify Departmental Representative in writing of satisfactory completion of Contractor's inspection and submit verification that corrections have been made.
    - .2 Request Departmental Representative review.
  - .2 Departmental Representative's review:
    - .1 Departmental Representative and Contractor to review Work and identify defects and deficiencies.
    - .2 Contractor to correct Work as directed.
  - .3 Completion Tasks: submit written certificates in English that tasks have been performed as follows:
    - .1 Work: completed and reviewed for compliance with Contract Documents.
    - .2 Defects: corrected and deficiencies completed.
    - .3 Work: complete and ready for final review.
  - .4 Final Review:
    - .1 When completion tasks are done, request final review of Work by Departmental Representative.
    - .2 When Work incomplete according to Departmental Representative, complete outstanding items and request re-review.

**1.03 FINAL CLEANING**

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

**2 PRODUCTS**

**2.01 NOT USED**

- .1 Not Used.

**3 EXECUTION**

**3.01 NOT USED**

- .1 Not Used.

**END OF SECTION**



**1 GENERAL**

**1.01 ADMINISTRATIVE REQUIREMENTS**

- .1 Pre-warranty Meeting:
  - .1 Convene meeting one week prior to contract completion with contractor's representative and Departmental Representative, in accordance with Section 01 31 19 - Project Meetings to:
    - .1 Verify Project requirements.
    - .2 Review manufacturer's warranty requirements.
  - .2 Departmental Representative to establish communication procedures for:
    - .1 Notifying construction warranty defects.
    - .2 Determine priorities for type of defects.
    - .3 Determine reasonable response time.
  - .3 Contact information for bonded and licensed company for warranty work action: provide name, telephone number and address of company authorized for construction warranty work action.
  - .4 Ensure contact is located within local service area of warranted construction, is continuously available, and is responsive to inquiries for warranty work action.

**1.02 ACTION AND INFORMATIONAL SUBMITTALS**

- .1 Provide submittals in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Three (3) weeks prior to Substantial Performance of the Work, submit to the Departmental Representative, two (2) final hard copies and one electronic copy of operating and maintenance manuals. Substantial completion will not be considered until this submission is completed.
- .3 Ensure spare parts, maintenance materials and special tools are new, neither damaged nor defective, and of same quality and manufacture as products provided in Work.
- .4 Provide evidence, if requested, for type, source and quality of products supplied.
- .5 Defective products will be rejected, regardless of previous inspections. Replace products at own expense.

**1.03 FORMAT**

- .1 Organize data as instructional manual.
- .2 Binders: vinyl, hard covered, 3 'D' ring, loose leaf 219 x 279 mm with spine and face pockets.
- .3 When multiple binders are used correlate data into related consistent groupings.
  - .1 Identify contents of each binder on spine.
- .4 Cover: identify each binder with type or printed title 'Project Record Documents'; list title of project and identify subject matter of contents.
- .5 Arrange content by Section numbers and sequence of the Table of Contents according to the contract documents Table of Contents.

- .6 Provide tabbed fly leaf for each separate product and system, with typed description of product and major component parts of equipment.
- .7 Text: manufacturer's printed data, or typewritten data.
- .8 Drawings: provide with reinforced punched binder tab. Bind in with text; fold larger drawings to size of text pages with drawing number and description visible.
- .9 Provide 1:1 scaled CAD files in dwg format on CD.

#### **1.04 CONTENTS - PROJECT RECORD DOCUMENTS**

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

#### **1.05 AS-BUILT DOCUMENTS**

- .1 Contract drawings and shop drawings: legibly mark each item to record actual construction, including:
  - .1 Measured locations of internal utilities and appurtenances, reference to visible and accessible features of construction.
  - .2 Field changes of dimension and detail.
  - .3 Changes made by change orders.
  - .4 Change Orders and other modifications to Contract.
  - .5 Details not on original Contract drawings.
  - .6 References to related shop drawings and modifications.
- .2 Contract Specifications: legibly mark each item to record actual 'workmanship of construction', including:
  - .1 Manufacturer, trade name, and catalogue number of each 'Product/Material' actually installed, particularly optional items and substitute items.
  - .2 Changes made by addenda and change orders.
- .3 As-built information:
  - .1 Record changes in red ink as work progresses.
  - .2 Mark on 1 set of drawings, specifications and shop drawings at completion of project and, before final review, neatly transfer notations to second set.
  - .3 Provide 1 set of CDs in PDF file format with all as-built information included.

- .4 Submit all sets to Departmental Representative.

#### **1.06 EQUIPMENT AND SYSTEMS**

- .1 Include manufacturer's printed operation and maintenance instructions.
- .2 Provide original manufacturer's parts list, illustrations, assembly drawings, and diagrams required for maintenance.
- .3 Additional requirements: as specified in individual specification sections.

#### **1.07 MATERIALS AND FINISHES**

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

#### **1.08 WARRANTIES**

- .1 Separate each Document with index tab sheets keyed to Table of Contents listing.
- .2 List subcontractor, supplier and manufacturer with name, address and telephone number of responsible principal.
- .3 Obtain warranties and inspection reports executed in by subcontractors, suppliers, manufacturers and inspection agencies within 10 days after completion of applicable item of work.
- .4 Except for items put into use with the Departmental Representative's permission leave date of beginning of time of warranty until the date of substantial performance is determined.
- .5 Verify that documents are in proper form, contain full information and are notarized.
- .6 Co-execute submittals when required.
- .7 Retain warranties and bonds until time specified for submittal with Operating and Maintenance manual.
- .8 Conduct joint 9 month warranty inspection, measured from time of acceptance, by Departmental Representative.

#### **1.09 COMPLETION**

- .1 Submit a written certificate that the following have been performed:
  - .1 Work has been completed and reviewed for compliance with the Contract documents.
  - .2 Defects have been corrected and deficiencies have been completed.

.3 Work is complete and ready for final review.

**2 PRODUCTS**

**2.01 NOT USED**

.1 Not Used.

**3 EXECUTION**

**3.01 NOT USED**

.1 Not Used.

**END OF SECTION**

## **1 GENERAL**

### **1.1 SUMMARY**

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- .1 Work included: labour, materials, equipment and services necessary for the following:
  - .1 Removal and disposal of existing building materials as indicated.
  - .2 Removal, identification and storage of existing building materials as indicated.

### **1.2 REFERENCES**

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- .1 WorkSafe BC.
- .2 CSA S350-M1980, Code of Practice of Safety in Demolition of Structures.
- .3 CAN/CSA-S269.2-M87 Access Scaffolding for Construction Purposes.

### **1.3 EXISTING CONDITIONS**

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- .1 Take over structures to be demolished based on their condition on date that contract is awarded.
- .2 Recording of existing conditions:
  - .1 The Contractor shall access, measure and/or photograph existing conditions prior to execution of the work.

### **1.4 DEMOLITION DRAWINGS**

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- .1 Where required by authorities having jurisdiction, submit for approval drawings, diagrams or details showing sequence of disassembly work and supporting structures in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Submissions to bear stamp of qualified professional engineer registered in Province of British Columbia.

### **1.5 PROTECTION**

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- .1 Prevent movement, settlement or damage of adjacent parts of existing building to remain. Provide bracing, shoring as required. Make good damage caused by demolition.
- .2 Take precautions to support affected structures and, if safety of building being demolished or adjacent structures or services appears to be endangered, cease operations and notify Departmental Representative.

- .3 Prevent debris from blocking surface drainage system, elevators, mechanical and electrical systems which must remain in operation.
- .4 Protect all adjacent surfaces and glazing.

## **2 PRODUCTS** (NOT USED)

## **3 EXECUTION**

### 3.1 WORK

- .1 Dispose of demolished materials except where noted otherwise and in accordance with authorities having jurisdiction.
- .2 Remove following materials and equipment, store, label with locations, protect and leave ready for installation by other sections of the work:
  - .1 Existing bike rack.
  - .2 Existing building signage.
  - .3 Others as indicated on drawings or as directed by Departmental Representative.
- .3 The following is a partial list of items that require removal and disposal:
  - .1 Roofing (at areas indicated) including existing membrane and insulation.
  - .2 Windows and doors.
  - .3 Window guards.
  - .4 Exterior electrical fixtures, outlets, and other components.
  - .5 Existing hose bibs.
  - .6 Others as indicated on drawings or as directed by Departmental Representative.

### 3.2 SAFETY CODE

- .1 Unless otherwise specified, carry out demolition work in accordance with Section 01 74 21 - Construction, Demolition Waste Management & Disposal, and CSA S350-M1980 Code of Practice of Safety in Demolition of Structures.

### 3.3 PREPARATION

- .1 If required, disconnect and re-route electrical and telephone service lines in accordance with authorities having jurisdiction. Post warning signs on electrical lines and equipment that must remain energized to serve other properties during period of demolition.
  - .1 Obtain any permits necessary.
- .2 If required, disconnect and cap designated mechanical services in accordance with authorities having jurisdiction.
  - .1 Obtain any permits necessary.

- .3 Do not disrupt active or energized utilities designated to remain undisturbed.
  - .1 All services are designated to remain active.
- .4 Label, and identify locations, orientation and layout of assemblies identified for reinstallation.
- .5 Remove and store in a safe location, assemblies identified for reinstallation.

#### 3.4 DEMOLITION

- .1 Perform work in a safe manner at all times in accordance with WorkSafeBC, project, and reference standard safety requirements and protocols.
- .2 Demolish parts of building to permit remedial work as indicated.
- .3 Remove existing equipment, services, and obstacles where required for refinishing or making good of existing surfaces, and replace as work progresses.
- .4 At the end of each day's work, leave work in safe condition so that no part is in danger of toppling or falling. Protect interiors of parts, and adjacent elements not be demolished from exterior demolition at all times.
- .5 Provide clean straight cut lines at the extent of all removals as indicated to allow future tie-ins.
- .6 Steel stud and concrete substrates are to be protected. Do not overcut.
- .7 Demolish to minimize dusting, airborne fungi, and other debris. Keep materials wetted as directed by Departmental Representative.
- .8 Do not sell or burn materials on site.
- .9 Remove contaminated or dangerous materials as defined by authorities having jurisdiction, relating to environmental protection, from site and dispose of in safe manner to minimise danger at site or during disposal.

END OF SECTION





## **1 GENERAL**

### **1.1 DESCRIPTION OF WORK**

- .1 Work in this Section includes but is not restricted to:
  - .1 New ramp, walkway, slab-on-grade, footings, and foundation walls.
  - .2 Architectural concrete (all above-grade, concrete elements along gridline 'A').
  - .3 Reinforcing of hollow concrete masonry unit (CMU) block walls.

### **1.2 REFERENCE STANDARDS**

- .1 Concrete work shall conform to the requirements of the latest edition of the following standards unless otherwise required by this specification.
  - .1 National Building Code of Canada.
  - .2 ANSI/ACI 315, Details and Detailing of Concrete Reinforcement.
  - .3 ACI 301, "Specification for Structural Concrete," Sections 1 through 5 and Section 6, "Architectural Concrete."
  - .4 ACI 303.1, "Specification for Cast-in-Place Architectural Concrete."
  - .5 ASTM A775/A775M, Specification for Epoxy-Coated Steel Reinforcing Bars.
  - .6 CAN/CSA-S269.3-M92, Concrete Formwork.
  - .7 CAN/CSA-A23.1/CAN/CSA-A23.2-14, Concrete Materials and Methods of Concrete Construction, Test Methods and Standard Practice for Concrete;
  - .8 CAN/CSA-A23.3-14, Design of Concrete Structures
  - .9 CAN/CSA-A3000-03 Cementitious Materials Compendium
  - .10 CSA G30.18-09, Carbon Steel Bars for Concrete Reinforcement.

### **1.3 SCOPE OF WORK**

- .1 Provide all labour, materials, services and equipment necessary and incidental for supply and installation of new concrete and reinforcing materials as specified herein and/or shown on the Drawings.

### **1.4 QUALITY CONTROL**

- .1 Upon request, provide Departmental Representative with certified copy of mill test report of reinforcing steel, showing physical and chemical analysis, minimum 4 weeks prior to commencing reinforcing work.
- .2 For architectural concrete only:
  - .1 Samples for Verification: Architectural concrete samples, cast vertically, approximately 450 by 450 by 50 mm (18 by 18 by 2 inches), showing finish, colour, and texture. Include Sample

sets showing the full range of variations expected in these characteristics.

- .2 Field Sample Panels: After approval of verification sample and before casting architectural concrete, produce field sample panels to demonstrate the approved range of selections made under sample submittals. Produce a minimum of 1 set of full-scale panels, cast vertically, approximately 1200 by 1200 by 150 mm (48 by 48 by 6 inches) minimum, to demonstrate the expected range of finish, colour, and texture variations.
  - .1 Maintain field sample panels during construction in an undisturbed condition as a standard for judging the completed Work.

## 1.5 FIELD REVIEW

- .1 Provide adequate notice to the Departmental Representative to ensure the opportunity of reviewing all prepared areas prior to placement of new concrete.
- .2 Contractor to pay all costs incurred for uncovering and making good any work covered before required review is completed and approved by the Departmental Representative.
- .3 Payment for field review and specified testing to be by the Contractor, including:
  - .1 Testing required by laws, ordinances, rules, regulations or orders of the public authorities.
  - .2 Field Review and testing performed exclusively for the Contractor's convenience.
  - .3 Concrete cylinder compressive strength tests.
- .4 Where tests or review by the Departmental Representative reveals work not in accordance with Contract requirements, the Contractor shall pay costs for additional tests or field review that the Departmental Representative may require to verify acceptability of the corrected work.

## **2 PRODUCTS**

### 2.1 CONCRETE MATERIALS - GENERAL

- .1 Type 10 Portland cement in accordance with CAN/CSA-A5.
- .2 Supplementary Cementing materials in accordance with CAN/CSA-A3000-03.
- .3 Concrete Aggregates in accordance with CAN/CSA-A23.1 Clause 5.
- .4 Water to be potable in accordance with CAN/CSA-A23.1, Clause 4.
- .5 Air entraining admixtures in accordance with CAN3-A266.1.
- .6 Water reducing admixtures in accordance with CAN3-A266.2.
- .7 Superplasticizing admixtures in accordance with CAN3-A266.6.

- .8 Chlorides either as a raw material or as a constituent in admixtures shall not be used.
- .9 Chairs, bolsters, bar supports, spacers: to CAN/CSA-A23.1.
- .10 Liquid membrane curing compounds shall not be used.

## 2.2 FORMWORK

- .1 Formwork materials - use plywood and wood formwork materials to CSA-O121, CAN/CSA-O86.1 and CSA-O151.
- .2 For architectural concrete:
  - .1 Form-facing panels for as-cast finishes: Exterior-grade plywood panels, non-absorptive, that will provide continuous, true, and smooth architectural concrete surfaces, medium-density overlay, Class 1, or better, complete with mill-applied release agent and edge sealed, complying with DOC PS 1.
  - .2 Form-release agent: Commercially formulated colourless form-release agent that will not bond with, stain, or adversely affect architectural concrete surfaces and will not impair subsequent treatments of those surfaces.

## 2.3 CAST-IN-PLACE CONCRETE

- .1 Refer to drawings for concrete mix design requirements.

## 2.4 REINFORCING STEEL AND ANCHORS

- .1 Fabricate reinforcing steel in accordance with CAN/CSA-A23.1, ANSI/ACI 315, and Reinforcing Steel Manual of Standard Practice by the Reinforcing Steel Institute of Canada, unless indicated otherwise.
- .2 Reinforcing steel: billet steel, grade 400, deformed bars to CAN/CSA-G30.18, unless indicated otherwise.
- .3 Obtain Departmental Representative's approval for locations of reinforcement splices other than those shown on placing drawings.
- .4 Ship bundles of bar reinforcement, clearly identified in accordance with bar bending details and lists.
- .5 Epoxy adhesive:
  - .1 2-component injectable adhesive shall be used for installation of threaded rods, dowels, and rebar into existing grout-filled concrete masonry. Adhesive shall be furnished in containers which keep component A and component B separate. Containers shall be designed to accept static mixing nozzle which thoroughly blends component A and component B and allows injection of the mixed adhesive directly into the drilled hole. Only injection tools and static mixing nozzles supplied by the manufacturer may be used. Injection adhesive shall be formulated to include the resin and hardener to provide optimal curing speed, high strength and stiffness.

- .1 Ultimate bond loads for 15.9 mm threaded rods and reinforcing bars into grout-filled masonry units to meet or exceed the following, based on manufacturer's data:
  - .1 Tension load: 63kN (14,200 lb) minimum
  - .2 Shear load: 58kN (13,075 lb) minimum
  
- .2 2-component injectable adhesive shall be used for installation of rebar dowels into existing and new cast-in-place concrete. Adhesive shall be furnished in containers which keep component A and component B separate. Containers shall be designed to accept static mixing nozzle which thoroughly blends component A and component B and allows injection of the mixed adhesive directly into the drilled hole. Only injection tools and static mixing nozzles supplied by the manufacturer may be used. Injection adhesive shall be formulated to include the resin and hardener to provide optimal curing speed, high strength and stiffness.
  - .1 The epoxy adhesive shall meet the following requirements:

Bond Strength ASTM C882-13A	
2 day cure	10.8 MPa
14 day cure	11.7 MPa
Compressive Strength ASTM D695 – 10	82.7 MPa
Compressive Modulus ASTM D695-10	2,600 MPa
Tensile Strength 7 day ASTM D638-14	49.3 MPa
Elongation at break ASTM D638-14	1.1%
Heat Deflection Temperature ASTM D648-07	50° C
Absorption ASTYM D570-98	0.18%
Linear Coefficient of Shrinkage on Cure ASTM D2566-86	0.008

## 2.5 STRUCTURAL GROUT

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- .1 Masonry Grout to be 20 MPa concrete 9mm aggregate, 150 mm slump

## 2.6 GRAVEL SUBBASE

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- .1 Clean well graded 19mm (¾") minus crushed gravel with maximum of 5% passing #200 sieve suitable for road base construction. Submit gradation information for review by Departmental Representative.

**2.7 CONCRETE MIXING  
EQUIPMENT**

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- .1 Pre-bagged concrete materials should be mixed in accordance with manufacturer's recommendations. Provide a drum mixer of adequate size for the amount of mixed material.

**2.8 CONCRETE PLACING  
AND FINISHING  
EQUIPMENT**

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- .1 Concrete placing and finishing shall be in accordance with CAN/CSA-A23.1.

**2.9 CONCRETE CURING  
EQUIPMENT**

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- .1 Moist curing shall be in accordance with CAN/CSA-A23.1. Curing compounds shall not be used.
- .2 Only clean materials are to be used for curing.
- .3 Sufficient clean burlap and water sprinklers are to be provided to ensure that concrete can be moist cured as specified.

**2.10 EQUIPMENT  
APPROVAL AND  
SUBSTITUTIONS**

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- .1 Departmental Representative may require the replacement of any unsatisfactory equipment during the work to ensure that the project specification is met.

**3 EXECUTION**

**3.1 FIELD BENDING OF  
REINFORCEMENT**

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

**3.2 PLACING  
REINFORCEMENT**

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- .1 Place reinforcing steel as indicated on structural drawings and in accordance with CAN/CSA-A23.1.
- .2 When specified use plain round bars as slip dowels in concrete. Paint portion of dowel intended to move within hardened concrete with one coat of asphalt paint. When paint is dry, apply a thick even film of mineral lubricating grease.
- .3 Prior to placing concrete, obtain Departmental Representative's approval of reinforcing material as placed.

- .4 Ensure cover to reinforcement is maintained during concrete pour.
- .5 Protect epoxy coated portions of bars with covering during transportation and handling.

**3.3 CONCRETE SLABS  
ON GRADE,  
EXTERIOR RAMPS,  
EXTERIOR STAIRS**

- .1 Excavate existing soil and any other pre-existing finished surfaces as required down to undisturbed soil or as approved by Geotechnical Consultant. Do not cast concrete until bearing strata has been reviewed and approved by the Geotechnical Consultant.
- .2 Proof roll exposed subgrade and locally remove all organic material and uncontrolled fill material, as directed by Geotechnical Consultant.
- .3 Place minimum 150mm (6") of compacted well graded crushed gravel on prepared subgrade. Fill any voids with compacted gravel. Compact to 98% standard proctor in maximum 150mm (6") lifts.
- .4 Interior slabs require 0.25mm (10 mil) poly vapour barrier below slab.
- .5 Place concrete to extents and slopes as shown on the drawings. Minimum thickness unless noted otherwise is 100mm (4").
- .6 Concrete testing to be done unless Departmental Representative gives written approval otherwise. Air entrainment and slump testing to be done on each pour. Cast 3 test cylinders for 7-day and 28-day strength confirmation for each pour.
- .7 Reinforce as shown on the drawings. Use concrete bricks for rebar chairs. Minimum cover unless noted otherwise is 75mm (3") to soil, 50mm (2") to formed surfaces and 50mm (2") to concrete surface. Non-chaired reinforcement is not permitted and reinforcement must be chaired at spacing that is close enough to avoid permanent deflection of the reinforcement.
- .8 For slab on grade provide control joints at a maximum of 3.7m (12ft) o/c in both directions unless noted otherwise on the drawings. Unless noted otherwise, control joints are to be 3mm (1/8") wide by ¼ of slab depth. Joints to be saw cut.
- .9 For walkways and ramps provide control joints at a maximum of 2.4m (8ft) o/c unless noted otherwise on the drawings. Unless noted otherwise, control joints are to be formed with purpose made grooving trowel that creates a joint depth of a minimum of 38mm (1½").
- .10 At joints with existing concrete walls, columns, slabs or other dissimilar materials, provide isolation board made from 6mm bituminous fibreboard.
- .11 All free edges of concrete slabs, walkways and ramps are to have a rounded edge profiled with a 6mm (¼") radius.

- .12 Embedded steel components must be set in forms prior to concrete placement unless approval is obtained from the Departmental Representative.
- .13 Finish exterior concrete with broom finish unless noted otherwise. Finish interior concrete with trowelled finished.
- .14 As soon as the concrete surface has been finished and can bear weight without marking, carefully cover with burlap. Place burlap sections to overlap each other by 150 mm (6 in.) or more and to overlap concrete wall section by 300 mm (1 ft) or more at each side. Thoroughly wet the burlap with water before placing it on the concrete and keep saturated during curing period with a water spray sufficiently fine to avoid damaging the concrete surface. Cover burlap with polyethylene sheeting to maintain saturation of concrete during curing periods. Contractor shall ensure that the burlap is kept wet at all times during curing period. Curing to be in accordance with the manufacturer's recommendations and CSA A23.1. Wet cure for 7 days.
- .15 Accessibility:
  - .1 Construct ramp and walkways to comply with Section 3.8, the accessibility requirements of the National Building Code of Canada.
  - .2 Ramp and walkways to have an uninterrupted width of not less than 1520mm (5ft), except at handrails which are permitted to project not more than 100mm (4") into the clear area.
  - .3 Construct ramp and walkways so that changes in adjacent level walking surfaces at joints in walkways and ramps, and transitions do not exceed 6mm (¼").

#### 3.4 CONCRETE FOOTINGS

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- .1 Excavate existing soil and any other pre-existing finished surfaces as required down to undisturbed soil or approved fill with minimum bearing capacity of 75 kPa – Service Limit State, 150 kPa – Ultimate Limit State. Proof roll exposed subgrade and locally remove all organic material and uncontrolled fill material.
- .2 Bearing strata to be minimum 460 mm (18 inches) below finished exterior grade, or as directed by Geotechnical Consultant. Do not cast concrete until bearing strata has been reviewed and approved by the Geotechnical Consultant.
- .3 Unless specified otherwise, place reinforcing steel as indicated on drawings and in accordance with CAN/CSA-A23.1.
- .4 Construct plywood forms to achieve the footing dimensions indicated in the drawings.
- .5 Ensure forms are straight and true and plumb within the tolerances of CAN/CSA-A23.1.
- .6 Prior to placing concrete, obtain Departmental Representative's approval of reinforcing material and placement.
- .7 Ensure cover to reinforcement is maintained during concrete pour. No free placement (wet dowelling) of reinforcement is permitted

after concrete placement. Wire tie all reinforcement in place prior to pouring.

- .8 Place and finish concrete in accordance with CSA-A23.1. Provide rough surface at locations where walls are to be cast on top of footings.
- .9 Allow concrete to cure to a minimum of 20 MPa prior to stripping of forms.
- .10 Curing to be in accordance with CAN/CSA A23.1.

### 3.5 ARCHITECTURAL CONCRETE WALLS AND PIERS

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- .1 Unless specified otherwise place reinforcing steel as indicated on drawings and in accordance with CAN/CSA-A23.1.
- .2 Construct plywood forms to achieve the wall sizes indicated in the drawings. Minimum wall thickness is 150mm (6") unless noted otherwise. Ensure form ties are uniform size and distribution. For exposed walls ensure form ties are snap off type in recessed cones that can be grouted and fully concealed.
- .3 Install steel embedment plates and anchor rods as indicated on drawings. Embedment plates and anchor rods shall be wired in place such that they maintain their required positions while concrete is being cast.
- .4 Ensure forms are straight and true and plumb within the tolerances of CAN/CSA-A23.1. Provide 19mm (¾") chamfered corners at vertical and horizontal edges.
- .5 Prior to placing concrete, obtain Departmental Representative's approval of reinforcing material and placement.
- .6 Ensure cover to reinforcement is maintained during concrete pour. No free placement (wet dowelling) of reinforcement is permitted after concrete placement. Wire tie all reinforcement in place prior to pouring.
- .7 Place and finish concrete in accordance with CSA-A23.1, to achieve a smooth-form finish.
  - .1 Architectural concrete to be uniform in colour, free of honeycombing, with minimal bug holes.
  - .2 Finish: in accordance with ACI 301 Surface Finish-3.0 (SF-3.0).
- .8 Allow concrete to cure to a minimum of 20MPa prior to stripping of forms.
- .9 Curing to be in accordance with CAN/CSA A23.1.
- .10 After stripping of forms grind any fins or protrusions within the repair area, and patch minor voiding.



### 3.6 ADDITION OF MIX WATER

- .1 Water to be used in accordance with manufacturer's written instructions.
- .2 Mix water addition shall conform strictly to CAN/CSA-A23.1.
- .3 No water shall be used to re-temper the concrete mix after the addition of superplasticizer.

### 3.7 DEFECTIVE CONCRETE AND PATCHING

- .1 Concrete repair surface to be free from open texturing, voids, and projections.
- .2 Repair of defective concrete work.
  - .1 Repair defective areas while concrete is still plastic, otherwise wait until curing is completed. Use repair methods approved by Departmental Representative.
  - .2 Grind off ridges and protrusions to match adjoining concrete as closely as possible.
- .3 Remove and replace defective concrete where directed. Removal and replacement procedures will be detailed by the Departmental Representative.
- .4 Repair of defective concrete work and/or removal and replacement of defective concrete prior to final acceptance of the work to be carried out at Contractor's expense.
- .5 Immediately after the removal of forms, all bolts, ties, nails or other metal not specifically required for construction purposes shall be removed or cut back to a depth of 25 mm (1") from the surface of the concrete.

### 3.8 PROTECTION

- .1 All freshly placed and consolidated concrete shall be suitably protected during the curing period against damage from adverse weather conditions including freezing and hot weather. Protection of the concrete from adverse weather conditions is the sole responsibility of the Contractor and shall be conducted in strict accordance with CAN/CSA-A23.1.

### 3.9 TOLERANCES

- .1 Tolerances shall conform to CAN/CSA-A23.1 or the requirements of these specifications, whichever are more rigorous.

**3.10 FIELD QUALITY  
CONTROL**

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- .1 Inspection and testing of concrete and concrete materials will be carried out by a Testing Laboratory in accordance with CAN/CSA-A23.1.
- .2 Ship prepaid 3 test cylinders to Testing Laboratory for compressive strength testing. Take three cylinders from each batch or from first truck, if more than one load is placed in same day.
- .3 Contractor will pay for costs of compressive strength tests.
- .4 Take additional test cylinders during cold weather concreting. Cure cylinders on job site under same conditions as concrete, which they represent.
- .5 Inspection or testing by Departmental Representative will not augment or replace Contractor quality control nor relieve him of his contractual responsibility.

END OF SECTION

## 1 GENERAL

### 1.1 SUMMARY

- .1 Work includes labour, materials, equipment and services necessary for supply and installation of new structural steel to support the new canopy roof.

### 1.2 REFERENCES

- .1 Canadian Standards Association (CSA).
  - .1 CSA-G40.20, General Requirements for Rolled or Welded Structural Quality Steel.
  - .2 CSA-G40.21, Structural Quality Steels.
  - .3 CSA-G164, Hot Dip Galvanizing of Irregularly Shaped Articles.
  - .4 CSA-S16.1, Limit States Design of Steel Structures.
  - .5 CSA-S136, Cold Formed Steel Structural Members.
  - .6 CSA W47.1, Certification of Companies for Fusion Welding of Steel Structures.
  - .7 CSA W48 Series-M1980 to M1992, Electrodes.
  - .8 CSA W55.3, Resistance Welding Qualification Code for Fabricators of Structural Members Used in Buildings.
  - .9 CSA W59, Welded Steel Construction (Metal Arc Welding).
- .2 Canadian General Standards Board (CGSB).
  - .1 CAN/CGSB-1.40, Primer Structural Steel, Oil Alkyd Type.
  - .2 CAN/CGSB-1.140, Oil-Alkyd Type Red Lead, Iron Oxide Primer.
  - .3 CGSB 85-GP-14M, Painting Steel Surfaces Exposed to Normally Dry Weather.
  - .4 CAN/CGSB-85.100, Painting.
- .3 American Society for Testing and Materials
  - .1 ASTM A53, Standard Specification of Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless

### 1.3 SHOP DRAWINGS

- .1 Submit shop drawings including fabrication and erection documents, and materials list in accordance with Section 01 33 00 – Submittal Procedures.
  - .1 On erection drawings, indicate all details and information necessary for assembly and erection purposes such as, description of methods, sequence of erection, type of equipment used in erection and temporary bracings.

### 1.4 SUBMITTALS

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

### 1.5 QUALITY ASSURANCE

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- .1 Upon request, submit 3 copies of mill test reports showing chemical and physical properties and other details of steel to be incorporated into work at least 4 weeks prior to fabrication of structural steel. Mill test reports shall be certified by metallurgists qualified to practice in province of British Columbia, Canada.

## 2 PRODUCTS

### 2.1 MATERIALS

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- .1 Structural steel: to CSA-G40.21. Grade as indicated (minimum 300W).
  - .1 Rolled Sections: 350W
  - .2 HHS (tube) Sections: 350W – Class C
  - .3 Bars & Plate: 300W
- .2 Steel pipe columns: to ASTM A53, minimum yield stress 205 mPa
- .3 Anchor bolts: to ASTM A 307.
- .4 Steel to wood connection bolts, nuts and washers: to ASTM A307
- .5 Steel to steel bolts, nuts and washers: to ASTM A 325M
- .6 Welding materials: to CSA W48 Series and CSA W59 and certified by Canadian Welding Bureau.
- .7 All steel to be hot dip galvanized unless noted otherwise.
- .8 Hot dip galvanizing: galvanize steel, where indicated, to CAN/CSA-G164, minimum zinc coating of 600 g/m<sup>2</sup>.

### 2.2 FABRICATION

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- .1 Fabricate structural steel in accordance with CSA-S16.1 and in accordance with reviewed shop drawings.
- .2 Continuously seal members by continuous welds. Grind smooth.

### 2.3 SHOP PAINTING

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- .1 Refer to Section 09 90 00 – Painting and Coating.

## 3 EXECUTION

### 3.1 GENERAL

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- .1 Structural steel work: in accordance with CSA-S16.1
- .2 Welding: in accordance with CSA W59.

- .3 Companies to be certified under Division 1 or 2.1 of CSA W47.1 for fusion welding of steel structures and/or CSA W55.3 for resistance welding of structural components.

### 3.2 CONNECTION TO EXISTING WORK

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

### 3.3 MARKING

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

### 3.4 ERECTION

- .1 Erect structural steel, as indicated and in accordance with CSA-S16.1 and in accordance with reviewed erection drawings.
- .2 Field cutting or altering structural members: do not cut or alter structural members or connections without written approval of Departmental Representative.
- .3 Clean with mechanical brush and touch up shop primer to bolts, rivets, welds and burned or scratched surfaces at completion of erection.
- .4 Continuously seal members by continuous welds where indicated. Grind smooth.

### 3.5 FIELD QUALITY CONTROL

- .1 Inspection and testing of materials and workmanship will be carried out by testing laboratory engaged by Contractor.
- .2 Provide safe access and working areas for testing on site, as required by testing agency and as authorized by Departmental Representative.
- .3 Submit test reports to Departmental Representative within 2 weeks of completion of inspection.
- .4 Testing of materials included in this section will be paid for by the Contractor.

### 3.6 FIELD PAINTING

- .1 Paint in accordance with Section – 09 90 00 – Painting and Coating.
- .2 Touch up all damaged surfaces and surfaces without shop coat with primer to match specified primer. Apply in accordance with MPI recommendations.

END OF SECTION

## 1 GENERAL

### 1.1 SUMMARY

- .1 This section covers the labour, materials, equipment and services necessary for the design, fabrication, and installation of all pre-finished aluminium components, including but not limited to:
  - .1 Louvres at windows.
  - .2 Other aluminium components as indicated.

### 1.2 REFERENCES

- .1 National Building Code of Canada 2015.
- .2 Canadian Standards Association (CSA)
  - .1 CAN3-S157-M83 Strength Design in Aluminum.
  - .2 CSA W47.2-M1987 Certification of Companies for Fusion Welding of Aluminum.
  - .3 CSA W59.2-M1991 Welded Aluminum Construction.
- .3 Canadian General Standards Board (CGSB)
  - .1 CAN/CGSB-12.1-M90, Tempered or Laminated Safety Glass
  - .2 CAN/CGSB-1.108 M89 Bituminous Solvent Type Paint.
- .4 American Architectural Manufacturers Association (AAMA)
  - .1 AAMA 2603-02 Voluntary Specification, Performance Requirements and Test Procedures for Pigmented Organic Coatings on Aluminum Extrusions and Panels.
  - .2 AAMA 2604-02 Voluntary Specification, Performance Requirements and Test Procedures for High Performance Organic Coatings on Aluminum Extrusions and Panels.
  - .3 AAMA 2605-02 Voluntary Specification, Performance Requirements and Test Procedures for Superior Performing Organic Coatings on Aluminum Extrusions and Panels.
- .5 American Society for Testing and Materials (ASTM)
  - .1 ASTM A193/A193M-94b Specification for Alloy-Steel and Stainless Steel Bolting.
  - .2 ASTM B 221M-93 Aluminum-Alloy Extruded Bars, Rods, Wire, Shapes, and Tube (Metric).
  - .3 ASTM B308/B308M-93 Aluminum-Alloy Standard Structural Shapes, Rolled or Extruded.
  - .4 ASTM B766-86 Standard Specification for Flat Glass.
  - .5 ASTM E488-90 Test Method for Strength of Anchors in Concrete and Masonry Elements.
- .6 Aluminum Association, Inc. (AA)
  - .1 AA 45 Designation System for Aluminum Finishes.
- .7 American Welding Society (AWS)
  - .1 AWS A5.10, Specification for Bare Aluminum and Aluminum Alloy Welding Electrodes and Rods.

### 1.3 QUALITY ASSURANCE

- .1 Work under this section shall be under one Contractor who will be required to furnish proof of qualifications including licence or approval by manufacturer, and shall have completed similar works.
- .2 Manufacture and installation shall be performed in conformance with the shop drawings approved by the Departmental Representative.

### 1.4 SHOP DRAWINGS

- .1 Submit shop drawings in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Provide shop drawings, indicating sizes, quantities, details, materials, fastenings, finishes, dimensions, etc., for the Departmental Representative's review before commencing fabrication. Dimensions shown on drawings to be verified on site before fabrication. Indicate glazing methods and materials on shop drawings.
- .3 Shop drawings for guards (new and reused), including all connection detailing, shall be sealed by a professional engineer registered in British Columbia. Suitability of base structure for guardrail attachment is the responsibility of the Departmental Representative.
- .4 Schedules: The Engineer who sealed the shop drawings shall submit to the Departmental Representative the APEGBC Model Schedule S-B Assurance of Design and Commitment for Field Review for Supporting Registered Professional with the initial shop drawing submission. The Engineer who sealed the shop drawings shall provide field review of the installation. On completion of the installation the Engineer shall submit to the Departmental Representative the APEGBC Model Schedule S-C Professional Assurance of Professional Field Review and Compliance.

### 1.5 SUBMITTALS

- .1 Submit shop drawings in accordance with Section Section 01 33 00 - Submittal Procedures.
- .2 Submit duplicate colour samples of finished aluminum extrusions used in modifications to the Departmental Representative for colour selection. Label samples indicating manufacturer's name, brand, type, finish and colour.

### 1.6 DESIGN CRITERIA

- .1 Design and install guards and anchorage to conform to the National Building Code of Canada. Design of the guard rails, connections and localized reinforcement of the structure is the responsibility of the railing supplier's engineer. Reuse of any existing anchor bolts must also be reviewed and approved by the railing supplier's engineer.
- .2 Design guards to meet National Building Code of Canada requirements including minimum guardrail height of 42" (1070mm)



above finished surfaces, maximum opening size of 4" (100mm), and no element located between 4" (100mm) and 36" (900mm) above the level protected by the guard will facilitate climbing. Provide infill panels as required to prevent climbing between railing posts and adjacent wall/column assembly.

- .3 Design handrails to meet National Building Code of Canada, section 3.8 accessibility requirements. Handrail to not project into clear area at ramp and sidewalk more than 4" (100mm).

### 1.7 MOCK-UP

- .1 Mock-up to be reviewed by Departmental Representative. Mock-up may form part of the finished work.

## **2 PRODUCTS**

### 2.1 MATERIALS

- .1 Louvres: Custom pre-finished 4" (100mm) x ¾" (19mm) aluminum airfoil blade profile extrusions complete with end caps fastened to rectangular frame made of 4" (100mm) x 1" (25mm) rectangular extrusions with mitred corners.
- .2 Aluminum Extrusions: Shapes as required to fulfil specified performance requirements of suitable alloy and proper temper for extruding and fabricating with adequate structural characteristics to meet design and performance requirements specified, and suitable for finishing as specified.
- .3 Aluminum Sheet: Shall be of quality suitable for application of finish specified and of thickness to provide distortion free surface completely free of oil canning under design loads specified.
- .4 **Anchoring System and Fasteners:**
  - .1 Wood Structures: Lag bolt or through-bolt connections to the wood structure structure. Bolts to be designed to meet loading requirements given the wood framing available for attachment.
  - .2 Concrete Structures: New anchor bolts. Type of anchor bolt to observe available edge distance, slab depth and post tension cabling if present.
  - .3 All bolt types to be 300 or 400 Series stainless steel complete with lock washers as required. Size and spacing as determined by railing supplier's engineer.
- .5 Structural steel – Grade 44W for angles, beams and plates and Grade 50W Class C for HSS members. All steel is hot dipped galvanized.
- .6 Structural steel bolts – A325 grade, corrosion protection to match the steel components being fastened.

### 2.2 FABRICATION

- .1 Verify all dimensions on site prior to proceeding with shop fabrication.

- .2 Grind smooth sharp edges, angles and corners.
- .3 Fabricate all work in accordance with shop drawings.
- .4 Fabricate items from aluminum, unless otherwise noted.
- .5 Use self-tapping shake-proof flat headed screws on items requiring assembly by screws. Screws to be located in concealed areas and be flush with finished product.
- .6 Ensure exposed welds are continuous for length of each joint. File or grind exposed welds smooth and flush.
- .7 Bolted work shall be carefully tightened with threads of bolts nicked to prevent subsequent loosening.

### 2.3 PAINTED FINISH

- .1 Powder coat system:
  - .1 Thermosetting powder coating that is polyester or fluoropolymer based and TGIC free.
  - .2 Polyester paint meeting the requirements of AAMA standard 2603-98.
  - .3 Multi-stage cleaning and chemical conversion pre-treatment system as per paint manufacturer's recommendations is required.
  - .4 Colour: Custom colour to be determined by Departmental Representative.
  - .5 Minimum paint thickness is 2.5 mil.
  - .6 Specular Gloss: 80 to 90. Provide sample for approval.
  - .7 Cross cut tape test as tested by ASTM Standard D3359 (Method B): 5B
  - .8 Mandrel bending test as tested by ASTM Standard D522: 1/8" (3mm) or less
  - .9 Resist cracking at impact of 80in/lb as tested by ASTM Standard D2794.
  - .10 Powder paint coatings shall be certified by the manufacturer using independent laboratory tests. Paint supplier must submit documentation supporting paint properties as tested including UV resistance for chalking and fading.
- .2 Colour:
  - .1 Louvres: White to match windows.
- .3 All exposed surfaces to be free of visible defects and scratches.
- .4 Minor scratches and blemishes shall be repairable with the coating manufacturer's recommended product or system. Such repairs shall match the original finish for colour and gloss and shall adhere to the original finish as per the adhesion requirements for the original paint.
- .5 Provide painted aluminium extrusion samples for approval.

### 3 EXECUTION

#### 3.1 EXAMINATION

- .1 Inspect to ensure all existing building conditions are suitable for securing aluminium components. This includes any reinforcement required of the existing structure. All reviews to be done before reinforced areas are covered.
- .2 For concrete structures, any existing anchor bolts which are reused must be reviewed by the aluminum supplier's engineer for acceptability and reuse. Damaged or cracked concrete around anchor bolts is not acceptable and must be repaired prior to installing railings. Existing anchor bolts that are not reused must be cut off flush with the concrete surface.
- .3 At concrete walls, ensure new railing/ handrail post attachments are located to avoid drains, flashings, and rainwater leaders.

#### 3.2 FABRICATION

- .1 New aluminium components are to be constructed in accordance with the drawing details for general arrangement and configuration.
- .2 Use self-tapping shake-proof flat headed screws on items requiring assembly by screws. Screws to be located in concealed areas and be flush with finished product.
- .3 Ensure exposed welds are continuous for length of each joint. File or grind exposed welds smooth and flush.
- .4 Grind smooth sharp edges, angles and corners.
- .5 Provide side drain holes in posts just above baseplate level.

#### 3.3 PAINTING

- .1 Painting of railings is to be done in controlled shop conditions in accordance with paint manufacturer's recommendations.

#### 3.4 ERECTION

- .1 Install units plumb, level and true to lines in accordance with the reviewed shop drawings.
- .2 All anchor bolts must have lock washers or other measures to prevent loosening over time and normal use.
- .3 Ensure baseplates are shimmed to be plumb. Use stainless steel shims on concrete surfaces. Provide gasket on stucco surfaces.
- .4 Ensure all baseplates and mounting plate perimeters are caulked including bolt heads and nuts. Provide separation tape between gasket and silicone caulking if gasket is not silicone compatible.

#### 3.5 GLAZING

- .1 Glaze guards in accordance with manufacturer's directions and reviewed shop drawings.

**3.6 PROTECTION AND  
CLEAN-UP**

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- .1 Protect the work of other sections from damage resulting from the work of this section. As work proceeds, and at completion, remove all surplus materials and deposit debris in containers provided or remove from site as directed.
- .2 Clean all guards at completion of work.
- .3 Touch up paint scratches and other damage with custom colour spray bombs or brush applied paint. Paint to be as recommended by the paint manufacturer for touch up work.

END OF SECTION

## 1 GENERAL

### 1.1 SUMMARY

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- .1 Work includes labour, materials, equipment and services necessary for:
  - .1 Treatment of new lumber and plywood.

### 1.2 REFERENCES

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- .1 CAN/CSA 080 Series 080.1-08 – Specification of treated wood.
- .2 CAN/CSA 080 Series 080.2-08 – Processing and treatment
- .3 CAN/CSA 080 Series 080.3-08 – Preservative formulations
- .4 CAN/CSA 080 Series 080.4-08 – Hydrocarbon solvents
- .5 CAN/CSA 080 Series 080.5-08 – Additives
- .6 American Wood Preserver's Association Standards 1996.

### 1.3 QUALITY ASSURANCE

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- .1 Inspection of products treated with preservative by vacuum-pressure impregnation will be carried out by an accredited inspection agency of the Canadian Wood Preservers Bureau (CWPB).
- .2 All treated lumber and plywood shall bear an identifying stamp in accordance with the CWPB requirements.

### 1.4 CERTIFICATES

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- .1 For products treated with preservative by vacuum-pressure impregnation submit following information certified by authorized signing officer of treatment plant:
  - .1 Information listed in AWPA.M2 and revisions specified in CAN/CSA-O80 Series, Supplementary Requirement to AWPA Standard M2 applicable to specified treatment.
  - .2 Moisture content after drying following treatment with water-borne preservative.
  - .3 Acceptable types of paint, stain, and clear finishes that may be used over treated materials to be finished after treatment.

### 1.5 ENVIRONMENTAL AND SAFETY

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- .1 Comply with requirements of Workplace Hazardous Materials Information System (WHMIS) regarding use, handling, storage, and disposal of hazardous materials; and regarding labelling and provision of material safety data sheets acceptable to WCB. Ensure that building occupants, as well as adjacent materials including landscaping are thoroughly protected.

## 2 PRODUCTS

### 2.1 MATERIALS

- .1 In general all lumber and plywood is to be pressure treated. Exceptions to this include:
  - .1 Plywood below PVC membranes.
  - .2 Plywood below roof membranes that are well vented spaces such as truss framed roofs. Plywood in flat roofs or vaulted roofs with moderate or little ventilation must be treated.
  - .3 Roof framing and trusses that are part of a well ventilated attic space.
- .2 All wood treatment to meet the requirements of CSA 080.1-08 for specific use and exposure. Where this specification is more strict than the CSA 080.1 standard then this specification will govern.
- .3 All lumber must be pressure treated after final cutting and fabrication whenever possible.
- .4 All wood products to be dried to below 19% moisture content after treatment by kiln drying. Wood products that require air drying instead of kiln dried are subject to the approval of to the Departmental Representative. If treated wood becomes wet after treatment and kiln drying it will need to be air dried to below 19% moisture content before installation.
- .5 For the purpose of this specification, the use of borate treated wood products is limited to areas where the wood will not be subject to continual or direct water runoff as noted in the following sections.
- .6 Preservative treatment for new lumber is to be as follows:
  - .1 Roof shingles/shakes: CCA 4.0 kg/m<sup>3</sup>.
  - .2 Framing inside of the moisture barrier and not subject to exterior humidity including stud walls, plates, headers, deck framing members (over living space): Borate (as B<sub>2</sub>O<sub>3</sub>) 2.8 kg/m<sup>3</sup>.
  - .3 Framing inside of the moisture barrier but subject to exterior humidity including balcony guards, parapet walls, balcony support posts, balcony and walkway framing (over non-living space): Borate (as B<sub>2</sub>O<sub>3</sub>) 2.8 kg/m<sup>3</sup>.
  - .4 Wood plates in contact with grade level concrete: Borate (as B<sub>2</sub>O<sub>3</sub>) 2.8 kg/m<sup>3</sup>.
  - .5 Framing outside of the moisture barrier including exposed deck boards, joists, stairs, beams and posts: ACQ-C or ACQ-D, 4.0 kg/m<sup>3</sup>.
  - .6 Wood framing in below grade conditions such as fence posts, deck posts, guardrail posts, and structural lumber: ACQ-D, 6.4 kg/m<sup>3</sup>.
- .7 Preservative treatment for new plywood is to be as follows:
  - .1 Wall and column sheathing inside of the moisture barrier and not subject to exterior humidity including exterior walls and well ventilated attic spaces: Borate (as B<sub>2</sub>O<sub>3</sub>) 2.8 kg/m<sup>3</sup>.
  - .2 Walls and column sheathing outside of the moisture barrier and subject to exterior humidity including balcony columns,

- parapets, deck upstands, roof divider walls, vaulted roofs, and flat roofs: Borate (as  $B_2O_3$ ) 2.8 kg/m<sup>3</sup>.
- .3 Roof and deck sheathing such as vaulted roofs and flat roofs: Borate (as  $B_2O_3$ ) 2.8 kg/m<sup>3</sup>.
  - .4 Strapping for wall cavities outside of the moisture barrier: CCA 4.0 kg/m<sup>3</sup> or Borate (as  $B_2O_3$ ) 2.8 kg/m<sup>3</sup>.
  - .5 Liners for windows and doors: Borate (as  $B_2O_3$ ) 2.8 kg/m<sup>3</sup>.
  - .6 Exposed plywood panel elements: CCA 4.0 kg/m<sup>3</sup>.
- .8 Preservative treatment for new glulam lumber is to be as follows:
    - .1 Beams and columns outside of the moisture barrier as in decks and balconies: ACQ 4.0 kg/m<sup>3</sup>.
  - .9 Field treatment of treated lumber is to comply with CSA 080.3. Minimum of two coats.
  - .10 Preservative field treatment for ACQ or CCA treated lumber or plywood is to be with an organic solvent such as Copper Napthenate.
  - .11 Preservative field treatment borate treated lumber or plywood is to be inorganic borate based insecticide / fungicide.
    - .1 Preservative field treatment to be dyed to allow easy identification of field treated wood areas. Dye additive to be:
      - .1 Sansin P-320
      - .2 Dye Tablets
      - .3 Food Colouring
      - .4 Approved alternative.
    - .2 Acceptable products:
      - .1 Boracol 20-2 BD Inorganic Boron Wood Preservative.
      - .2 Pre-Ser-Vor 25-3 Inorganice Boron Wood Preservative.
      - .3 Shellguard Insecticide and Fungicide Concentrate for Wood.

### 3 EXECUTION

#### 3.1 FACTORY APPLICATIONS OF PRESERVATIVES

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- .1 All new lumber shall be factory treated to obtain an average net retention as specified.
- .2 Incising is to be used as required to obtain a uniform penetration of treatment to the specified retention requirements. Incising to be done prior to treatment.
- .3 Minimum depth of penetration in solid lumber is to meet CSA 080.1 Table 5 requirements but not less than 10mm for wood less than 115mm and not less than 13mm for wood greater than or equal to 115mm.
- .4 Retention values and depth of penetration is to be verified by assay method.

- .5 Composite boards must not be pressure treated with a waterborne preservative. OSB incorporating zinc borate during the manufacturing process may be available if required as directed by Departmental Representative.
- .6 Glulam beams or columns are to be pressure treated after gluing unless the final product is too large for the treatment chamber in which case the laminations will be treated before gluing.
- .7 Following water-borne preservative treatment, dry all dimension lumber and plywood sheathing to maximum moisture content of 19%.

### 3.2 FIELD APPLICATION OF PRESERVATIVES

- .1 Field treat the following areas with the appropriate product:
  - .1 All cut ends of treated wood products.
  - .2 All bolt holes, chamfers, cuts, notches, etc to be thoroughly coated by submersing into preservative or other means acceptable to Departmental Representative if submersion is not practical.
  - .3 Existing dimension lumber and plywood that is not removed and replaced but exposed during the course of the retrofit may require treatment as directed by Departmental Representative. Existing treated plywood or lumber which is in good condition and not affected by mold will generally not require field treatment. Retained wood can be treated with either copper naphthenate or borate based preservative at the direction of the Departmental Representative. Retained wood that is field treated with copper naphthenate is to be dried prior to treatment. Retained wood that is field treated with borate based preservative can be damp prior to treatment. Before covering up retained wood it must be below 15% moisture content.
- .2 Field Application of wood preservatives to be applied by qualified personnel, in accordance with the manufacturers' instructions but not less than:
  - .1 Two coats applied by brush or roller. Underside of plywood decks can be done by spraying in two coats.
  - .2 Minimum 3-minute immersion of wood in preservative.

END OF SECTION



## 1 GENERAL

### 1.1 DESCRIPTION

- .1 The work of this section includes but is not limited to:
  - .1 New wood framed roof canopy.
  - .2 New wood framed storage room.
  - .3 Wood blocking at interior window/door perimeters.
  - .4 New sliding barn door.

### 1.2 REFERENCES

- .1 CSA B111-1974 Wire Nails, Spikes and Staples.
- .2 CAN/CSA-G164-M92 Hot Dip Galvanizing of Irregularly Shaped Articles.
- .3 CSA O121-M1978 Douglas Fir Plywood.
- .4 CAN/CSA-O141-91 Softwood Lumber.
- .5 CSA O151-M1978 Canadian Softwood Plywood.
- .6 National Lumber Grades Authority (NLGA) Standard Grading Rules for Canadian Lumber 1991.
- .7 American Society For Testing And Materials (ASTM)

### 1.3 QUALITY ASSURANCE

- .1 Lumber identification: by grade stamp of an agency certified by Canadian Lumber Standards Accreditation Board.
- .2 Plywood identification: by grade mark in accordance with applicable CSA standards.

## 2 PRODUCTS

### 2.1 LUMBER MATERIAL

- .1 Shall be in accordance with NBCC Part 9 Requirements as a minimum.
- .2 All wood except cedar to be pressure treated in accordance with Specification 06 05 73.
- .3 Lumber: unless specified otherwise, softwood, S4S, moisture content 19% or less in accordance with following standards:
  - .1 CAN/CSA-O141.
  - .2 NLGA Standard Grading Rules for Canadian Lumber.
- .4 Furring, blocking, nailing strips, cants, curbs, fascia backing and sleepers:

- .1 Board sizes: Hem-Fir No. 2 or better grade, unless noted otherwise
  - .2 Dimension sizes: Hem-Fir No. 2 or better grade, unless noted otherwise
  - .3 Post and timbers sizes: Hem-Fir No. 2 or better grade.
- .5 New boards at roof overhang soffits and roof canopy:
- .1 Cedar, tongue and groove board.

## 2.2 ENGINEERED LUMBER MATERIALS

- .1 Laminated Strand Lumber (LSL)
  - .1 Minimum Modulus of Elasticity: 10 686 mPa
  - .2 Minimum Specified Flexural Stress: 29.6 mPa
  - .3 Minimum Specified Shear Stress: 3.96 mPa
- .2 Laminated Veneer Lumber (LVL)
  - .1 Minimum Modulus of Elasticity: 13 790 mPa
  - .2 Minimum Specified Flexural Stress: 33.1 mPa
  - .3 Minimum Specified Shear Stress: 3.65 mPa
- .3 Parallel Strand Lumber (PSL)
  - .1 Minimum Modulus of Elasticity: 15 168 mPa
  - .2 Minimum Specified Flexural Stress: 37.0 mPa
  - .3 Minimum Specified Shear Stress: 3.72 mPa
- .4 Submit proposed Engineered Lumber Materials to Departmental Representative prior to installation

## 2.3 PANEL MATERIALS

- .1 Douglas fir plywood (DFP): to CSA O121, standard construction grade, 19mm unless specified otherwise.

## 2.4 ACCESSORIES

- .1 Corrosion resistant coatings on connectors and fasteners is as follows:
  - .1 For non-ACQ treated wood and interior of the exterior sheathing plane and moisture barrier, all connectors to be a minimum of G90 hot dipped galvanizing and fasteners to be hot dipped galvanized. Screw fastener coatings are as noted below. Typical application is in stud cavities, heated attics, below decks in heated spaces.
  - .2 For non-ACQ treated wood and in covered unheated areas not subject to direct moisture, all connectors to be a minimum of G185 hot dipped galvanizing and fasteners to be hot dipped galvanized. Screw fasteners are as noted below. Applies to balcony soffits, parapets, roof attics and unheated decks.

- .3 For non-ACQ treated wood and in exposed conditions subject to direct moisture, all connectors to be a minimum of G185 hot dipped galvanizing and fasteners to be hot dipped galvanized. Screw fasteners are as noted below. Applies to exposed panels, fascia boards, cedar boards, deck boards.
- .4 For ACQ treated wood in all locations all connectors and fasteners to be stainless steel unless noted otherwise. Do not combine stainless connectors with non-stainless fasteners.
- .2 Hot dipped galvanized fasteners to meet the following requirements:
  - .1 Hot dipped galvanizing to meet CAN/CSA-G164 and ASTM A653. Nails, spikes and lag screws when hot dipped galvanized are to meet ASTM A153 Class D at 1.0 oz of zinc per sq ft of surface area of the fastener. Bolts, washers and nuts are to meet ASTM A153 Class D at 1.25 oz of zinc per sq ft of surface area of the fastener.
  - .3 Corrosion protected screws:
    - .1 Corrosion resistant coatings for screws to meet the following requirement:
      - .1 For non-exposed conditions interior of the exterior sheathing plane and moisture barrier:
        - .1 Zinc plated with a yellow chromate conversion coating.
        - .2 Coating to meet 50 hours of salt spray test to ASTM B117.
      - .2 For exposed conditions and in covered unheated areas not subject to direct moisture exterior of the moisture barrier or subject to exterior humidity (not including ACQ wood applications)
        - .1 Zinc rich base coat with conversion coating and a baked on protective barrier coating.
        - .2 Coating to meet 500 hours of salt spray test to ASTM B117.
      - .3 For exposed conditions in exposed conditions subject to direct moisture (not including ACQ wood applications)
        - .1 Zinc rich base coat with conversion coating and a baked on protective barrier coating.
        - .2 Coating to meet 1000 hours of salt spray test to ASTM B117.
  - .4 Stainless steel screws:
    - .1 For exposed and unexposed conditions where screws are in contact with ACQ wood. Can also be used in fully exposed conditions subject to moisture such as deck boards.
      - .1 Approved products:
        - .1 Stainless steel wood screws.
        - .2 Approved alternate.
  - .5 Stainless steel components to meet the following requirements.

- .1 Nails and spikes (when stainless steel) are to be, 304 or 316 Series, purpose made for replacement of conventional nails.
  - .2 Stainless steel screws to be 304 or 316 Series.
  - .3 Stainless steel bolts to be 304 or 316 Series.
  - .4 Connectors (hangers, framing anchors) to be stainless steel Type 316L.
- .6 Screws
- .1 #8 minimum size (length to suit) wood screws with Robertson flat head.
  - .2 Fabricate to ANSI B18.6.4
  - .3 For screws into concrete use hex-head screws complete with washers. Concrete substrate requires predrilling for screw placement.
  - .4 For non-ACQ installations use ITW Buildex Tapcon Hex washer head with Climaseal Coating, ¼" diameter x 1¾" long minimum (1½" (38mm) min. embedment adjust length to suit thickness of material).
  - .5 For ACQ installations use stainless steel pin bolts, minimum of ¼" diameter x 2" long with minimum of 1" (25mm) embedment.
- .7 Nails, spikes and staples:
- .1 Fabricate to CSA B111.
  - .2 Minimum nail length to be 2.5" (64 mm). Refer to Part 9 for other minimum fastener requirements. Refer to the drawings for specific requirements.
- .8 Staples:
- .1 Fabricate to CSA B111.
  - .2 16 ga. 304 Series stainless steel staples compatible with material, sheathing, framing or other substrate being fastened. Length to be 2" (50 mm). Zinc coated staples will not be accepted.
- .9 Bolts:
- .1 Size to be 1/2" (13 mm) minimum diameter unless indicated otherwise, complete with nuts and washers
  - .2 To meet requirements of ASTM A307
- .10 Proprietary fasteners: toggle bolts, expansion shields and lag bolts, screws, explosive actuated fastening devices, recommended for purpose by manufacturer and as approved by the Departmental Representative.
- .11 Deck/balcony sheathing waterproof adhesive to CGSB 71-GP-26M, cartridge loaded.
- .1 Non-flammable, synthetic rubber and resin, formaldehyde free formula
  - .2 VOC content 0.3% by weight or less (5.2g/L)
  - .3 Shear strength to ASTM D3498:
    - .1 Wet Lumber greater than 150 psi (1.03 MPa)
    - .2 Frozen Lumber greater than 100 psi (0.69 MPa)

- .3 Dry Lumber greater than 150 psi (1.03 MPa)
- .4 Gap Filling greater than 100 psi (0.69 MPa)
- .12 Sill gasket: expanded polyethylene foam.

### **3 EXECUTION**

#### **3.1 PREPARATION**

- .1 All new plywood sheathing and dimension lumber, including blocking, furring and cants are to be treated at an approved facility.
- .2 All exposed lumber and plywood which is exposed during the course of work but is not replaced to be treated with surface-applied wood preservative as directed by Departmental Representative. Exposed lumber and plywood which is pre-treated does not require additional field treatment as approved by the Departmental Representative.
- .3 All engineered wood products (LSL, LVL & PSL) to be coated with clear urethane sealant prior to installation. Provide test samples of each product/sealant combination for approval by Departmental Representative prior to installing permanent pieces.

#### **3.2 INSTALLATION**

- .1 Comply with requirements of National Building Code of Canada, supplemented by the following paragraphs.
- .2 Install furring and blocking as required to space-out and support windows, parapets, wall and ceiling finishes, facings, fascia, soffit, and other work as required.
- .3 Align and plumb faces of furring and blocking to tolerance of 1:600.

- .4 Install rough bucks, nailers and linings to rough openings as required to provide backing for frames and other work. All liners must be attached to the structural substrate around the rough opening with fasteners appropriate for the substrate at a maximum spacing of 12" (305mm) o/c. Ensure all new screws do not penetrate adjacent gas lines or electrical conduits.
- .5 Install all screws and other fasteners to be flush with the wood surface whenever the wood is being covered by sheathing or membrane.
- .6 Install wood cants, fascia backing, nailers, curbs and other wood supports as required and secure using galvanized steel fasteners.
- .7 Plywood cap build ups are typically two layers of plywood which must be secured to the concrete parapet through all layers of the plywood. Purpose made screws are to secure both layers of plywood to the concrete substrate. For caps which also serve as a drop zone for window washing lines (i.e. Lines will go over the parapet) provide additional heavy duty stainless steel oversize washers to aid in holding the plywood to the concrete substrate.

### 3.3 ERECTION

- .1 Frame, anchor, fasten, tie and brace members to provide necessary strength and rigidity.
- .2 Countersink bolts where necessary to provide clearance for other work.
- .3 Provide temporary support and shoring in accordance with WorkSafe BC for the structure while working on structural members.

END OF SECTION

## 1 GENERAL

### 1.1 DESCRIPTION

- .1 Work described in section includes but is not limited to:
  - .1 Exterior wall insulation including insulation at penetrations as required.
  - .2 Exterior roof insulation including insulation at penetrations as required.
  - .3 Sprayfoam insulation at selected locations.

### 1.2 REFERENCES

- .1 Canadian Standards Association (CSA)
  - .1 CSA A101-[M1983] Thermal Insulation, Mineral Fibre, for Buildings.
- .2 Canadian General Standards Board (CGSB)
  - .1 CAN/CGSB-51.20-[M87] Thermal Insulation, Polystyrene, Boards and Pipe Covering.
  - .2 CAN/CGSB-51.38-[92], Cellular Glass Thermal Insulation.
  - .3 CGSB 71-GP-24M-[77] Adhesive, Flexible, for Bonding Cellular polystyrene Insulation.
- .3 CAN-UC-S705.1-98 Spray-Applied Rigid Polyurethane Cellular Plastic Thermal Insulation.
- .4 CAN/ULC-S705.2-98 The Installation of Spray Foam-in-Situ Urethane Insulation for Residential Building Construction.
- .5 Canadian Urethane Foam Contractors Association Inc. Spray Applied Rigid Insulation Handbook
- .6 American Society for Testing and Materials (ASTM)
  - .1 ASTM E 96-[96] Test Methods for Water Vapor Transmission of Materials.

### 1.3 DELIVERY, STORAGE AND HANDLING

- .1 Deliver materials to the job site in manufacturer's original packaging, containers and bundles with manufacturer's brand name and identification intact and legible.
- .2 Store level and handle materials to protect against contact with damp and wet surfaces, exposure to weather, breakage and damage to edges. Provide air circulation under covering and around stacks of materials.

### 1.4 MOCK-UP

- .1 Construct one mock-up minimum 10 m<sup>2</sup> of rigid insulation, including insulation retaining pins, insulation spacers, Z-girts, one inside corner, one outside corner, and one window as requested by the Departmental Representative. Mock-up may be part of the finished work.

## 1.5 WARRANTIES

- .1 Provide product warranty to include insulation material to be free of any defects affecting performance and adjacent elements.

## 1.6 EXISTING CONDITIONS

- .1 The Contractor is to be aware that the design intent is to provide Z-girt support for the new stucco cladding at a maximum spacing of 400 mm.
- .2 The Contract is expected to consider the need for cutting and fitting of the rigid insulation.

## **2 PRODUCTS**

### 2.1 INSULATION

- .1 Type and thickness of insulation required is as specified in the drawings and wall schedules. Minimum insulation thickness if not specified is 2 inches (50mm).
- .2 Insulation types are not to be mixed in a given wall/roof assembly.
- .3 Insulation Types:
  - .1 Mineral Fibre Insulation for wall insulation (assemblies W1, W2, W3):
    - .1 Non-combustible as tested to CAN4-S114 and ASTM E-136.
    - .2 Minimum R-value of 4.2 (RSI 0.74) per inch at 24 degrees C.
    - .3 Density of 4.4 lbs/cu ft (70 kg/m<sup>3</sup>) as per ASTM C 303.
    - .4 Water adsorption less than 0.1% when test in accordance with ASTM C1104.
    - .5 Surface burning characteristics when tested to CAN4-S102.
      - .1 Flame Spread Index = 0.
      - .2 Smoke developed none
  - .2 Mineral Fibre Insulation for roof insulation (assembly R1)
    - .1 Semi-rigid, monolithic, dual-density mineral wool insulation board intended for use with torch applied roofing membranes
    - .2 High density top layer, impregnated with bitumen top layer to ASTM C726
    - .3 Non-combustible as tested to CAN4-S114 and ASTM E-136.
    - .4 Thermal resistance to ASTM C518:
      - .1 RSI 0.74 m2K/W at -4 °C.
      - .2 RSI 0.72 m2K/W at 4 °C.
      - .3 RSI 0.68 m2K/W at 24 °C.
      - .4 RSI 0.64 m2K/W at 43 °C.
    - .5 Density to ASTM C303:



- .1 Top layer: 220 kg/m<sup>3</sup>.
- .2 Bottom layer: 160 kg/m<sup>3</sup>.
- .6 Water absorption less than 1.2 % when test in accordance with ASTM C209.
- .7 Surface burning characteristics when tested to CAN4-S102.
  - .1 Flame Spread Index = 0.
  - .2 Smoke developed none
- .3 Tapered Insulation for roof (assembly R1)
  - .1 Closed cell expanded polystyrene (EPS) to CAN/ULC-S710, Type 3
  - .2 Thermal Resistance to ASTM C518: min. R-value 3.75 (RSI 0.65) per inch.
  - .3 Maximum Water Vapour Permeance to ASTM E96: 5.0 US Perms (300 Perms)
  - .4 Maximum Water Absorption to ASTM D2842: 6.0% by volume
  - .5 Minimum Flexural Strength to ASTM C203: 25 psi (170kPa)
- .4 Rigid Insulation:
  - .1 Extruded polystyrene: to CAN/CGSB-51.20, Type 3.
  - .2 Minimum 5-year aged R-value of 5.5 (RSI 1.0) per inch at 4 degrees C.
  - .3 Minimum compressive strength of 25 psi (170 kPa)
- .5 Rigid Insulation Board with Cement Facer (CT Board):
  - .1 Pre-finished, factory-applied 5/16" (8 mm) (nominal) thick latex-modified concrete facing
    - .1 Finish: broomed.
    - .2 Edge treatment: tongue-and-groove at vertical joints.
  - .2 Foam Compressive Strength-Vertical to ASTM D1621: 35 psi (241 kPa), min.
  - .3 Mortar Compressive Strength (at 28 days), to CSA A23.2-09: 4600 psi (32 MPa), min.
- .6 Spray Applied Insulation:
  - .1 Closed cell, spray applied polyurethane foam, medium density.
  - .2 Meeting the requirements of CAN / ULC-S705.1-01 (including Amendments 1 and 2).
  - .3 Certified by EcoLogo as containing a minimum of 5% recycled content by mass of finished product.
  - .4 Product to utilize Zero ODS (Ozone Depleting Substance) blowing agent.
  - .5 Minimum 28-day oven aged R-value of 5.9 per inch (RSI 1.04 per 25mm).

## 2.2 ATTACHMENT ACCESSORIES

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- .1 For rigid insulation and mineral fibre insulation use girt flanges and 3" (75mm) long bent metal angles, minimum AZM150 and 20gauge, screwed to girts.

- .2 Self drilling self tapping screws, corrosion resistant capable of salt spray testing per ASTM B117 providing 2000 hours red rust and 30 cycles Kesternich SO<sub>2</sub>.
  - .1 Provide samples submitted with mechanical information and corrosion protection test data.
- .3 Adhesive: Quick curing, two component bead applied polyurethane adhesive.
- .4 Insulation retaining pins with rigid metal or plastic clip angles as required for rigid insulation. Pins to be hot dipped galvanized steel, welded aluminium or stainless steel with stainless steel attachment screws.
- .5 Insulation retaining pins for mineral fibre insulation in metal panel wall assemblies to be purpose made stick pins complete with tab to allow fastening of pins by screws directly to steel stud framing in behind the wall sheathing. Pins to be hot dipped galvanized steel, welded aluminium or stainless steel with stainless steel attachment screws.

### 3 EXECUTION

#### 3.1 SURFACE PREPARATION

---

- .1 Prepare all surfaces in strict accordance with manufacturers written instructions.
- .2 Surface to receive insulation shall be smooth, level, dry, clean, free from dust, dirt and other detrimental materials.
- .3 Examine substrates and immediately inform Departmental Representative in writing of defects.

#### 3.2 INSTALLATION

---

- .1 Mineral Fibre Semi Rigid Insulation at Walls:
  - .1 Install mineral fibre insulation boards on outer surface of air barrier of wall cavity with fibreglass thermal retaining clips attached to the Z-girts/ hat tracks as shown.
  - .2 Cut and fit insulation tight around electrical boxes, plumbing and heating pipes and ducts, around exterior doors and windows and other protrusions.
  - .3 Cut and trim insulation neatly to fit spaces. Use largest possible dimensions to reduce number of joints.
    - .1 Rigid boards that are not tight fitting will not be accepted and Departmental Representative will identify non-tight fitting insulation for replacement.
  - .4 Offset both vertical and horizontal joints in multiple layer applications.
  - .5 Provide insulation in the narrow slots adjacent to the window and door assemblies.
  - .6 Mineral fibre insulation is to be within 1/8" (3mm) of the surface of the self-adhered membrane. No gaps in the insulation is

permitted that exceed 1/8" (3mm) and should generally be snug fitting at seams and joints.

- .2 Mineral Fibre Semi Rigid Insulation at Roofs:
  - .1 Adhere all insulation into adhesive ribbons at 6" (150mm) o/c.
  - .2 Ensure all board joints are staggered (offset from underlying boards) to minimize thermal bridging and are tight fitting. Board gaps are not acceptable and will need to be sliver filled with similar insulation or replaced.
- .3 Tapered Insulation at Roofs:
  - .1 Adhere all insulation into adhesive ribbons at 6" (150mm) o/c.
  - .2 Ensure all board joints are staggered to minimize thermal bridging and are tight fitting. Board gaps are not acceptable and will need to be sliver filled with similar insulation or replaced.
- .4 CT Board:
  - .1 Install boards with tight to be within 1/8" (3mm) of the surface of the self-adhered membrane. No gaps in the insulation is permitted that exceed 1/8" (3mm) and should generally be snug fitting.
  - .2 Provide tongue-and-groove edges at vertical joints.
  - .3 Adhere all insulation into adhesive ribbons at 6" (150mm) o/c.
  - .4 Cut panels to fit snugly around jogs, protrusions, and corners.
  - .5 Ensure no insulation is exposed at edges. Provide metal flashing closures at corners.
- .5 Spray Applied Polyurethane Insulation
  - .1 Install in conformance with CAN/ULC-S705.2 with qualified installers.
  - .2 Review and prepare substrates including membranes and galvanized steel supports to provide continuous bond of insulation.
  - .3 Ensure no spray applied insulation is in contact with window or door assemblies.
- .6 Do not enclose insulation until it has been reviewed and approved by Departmental Representative.

### 3.3 CLEAN-UP

- .1 Upon completion of the work of this section clean-up all insulation and debris associated with work.

END OF SECTION



## 1 GENERAL

### 1.1 SUMMARY

- .1 Work included: labour, materials, equipment and services necessary for installation of exterior sheathing paper where indicated.

### 1.2 REFERENCES

- .1 CCMC Technical Guide, Air Barrier Materials for Exterior Walls for Lowrise Buildings
- .2 ASTM E1424 - Air Infiltration Testing
- .3 AATCC-127 - Water Resistance Test: Hydrostatic Pressure Test
- .4 TAPPI T-460 - Air Resistance Test
- .5 ASTM E96 - Standard Test methods for Water Vapour Transmission of Materials.
- .6 ASTM D1117 - Methods of Testing Non-woven Fabrics

### 1.3 SUBMITTALS

- .1 Product Data: Provide data on material characteristics performance criteria limitations.
- .2 Manufacturer's installation instructions: Indicate preparation installation requirements and techniques, product storage and handling criteria.

## 2 PRODUCTS

### 2.1 SHEET MATERIAL

- .1 A non-perforated, nonwoven, non-absorbing, breathable fabric barrier that resists air flow, bulk water and wind driven rain.
- .2 Physical properties:
  - .1 Commercial-grade spun-bonded polyolefin fabric barrier.
- .3 Performance Characteristics:
  - .1 Air penetration: Maximum of 0.001 cfm/sq ft at 75Pa when tested in accordance with ASTM E2178, Type 1 per ASTM 1677.
  - .2 Water Vapour Transmission: Minimum 28 Perms (Imperial) when tested in accordance with ASTM E96, Method B.
  - .3 Tear Resistance: 12/10 lbs. When tested in accordance with ASTM D1117.
  - .4 Water Penetration Resistance: Minimum 280 cm (110 inches) when tested in accordance with AATCC Test Method 127.

## 2.2 ACCESSORIES

- .1 Seam tape:
  - .1 3-mil UV resistant polypropylene film and coated with high shear, high tack solvent based acrylic adhesive.
- .2 Sealant: to be as indicated in 07 92 00 Joint Sealants. Approved sealant to be used unless indicated otherwise.
- .3 Termination strips (termination of sheathing paper and membrane): 24 Ga. Galvalume AZ150 galvanized steel, 75mm wide.
- .4 Termination bars (securing of sheathing paper and membrane at terminations): minimum 18 Ga., AZ150 galvanized steel, 20 mm wide.
- .5 Self adhered membrane at corners to be as indicated in 07 27 13 Modified Bituminous Sheet Air Barriers.

## **3 EXECUTION**

### 3.1 PREPARATION

- .1 Verify that surface and conditions are ready to accept work of this Section in accordance with the manufacturer's recommendations. Remove all sharp objects or obstructions prior to applying sheathing paper.

### 3.2 INSTALLATION

- .1 Install materials in accordance with manufacturer's written guidelines and recommendations. In case of conflict with the requirements specified herein and the manufacturer's recommendations, the more stringent of the two will apply.
- .2 Tape and seal all joints to provide a continuous air / moisture barrier.

### 3.3 WALL SURFACE

- .1 For base of wall details where there is no lower waterproof membrane, install the lowest layer of sheathing paper horizontally in successive strips beginning a minimum of 2 inches (50mm) below the lowest point of the wood framing and progressing upwards with each succeeding sheet. Install sealant at foundation wall overlap to complete air barrier seal to foundation wall.
- .2 For base of wall details with a waterproof membrane, install the lowest layer of sheathing paper horizontally in successive strips beginning a minimum of 2 inches (50mm) below the upper edge of the waterproof membrane and progressing upwards with each succeeding sheet.
- .3 Follow the specific requirements for lapping and integration with flashings described in the details.
- .4 Horizontal laps should be a minimum of 6 inches (150mm) and arranged to shed water away from the wood surface, ie. upper sheet overlapping the lower sheet.

- .5 Vertical laps shall be made where required and have a minimum 6 inch (150mm) overlap except at corners where a minimum 12 inches (300mm) overlap is required.
- .6 At all staple fastener locations, apply tape over the staple penetration area.
- .7 If the sheathing paper has been damaged resulting in perforation, cover damaged area with new material ensuring that lapping rules have been followed. For small tears or perforations apply a small dab of sealant or tape to the damaged area and then cover with a small piece of the sheathing paper.
- .8 Ensure that lapping rules have been followed at intersections with membrane and sheet metal flashings as per the details. Install sealant as required to complete air barrier.
- .9 Fully form all inside corners to prevent tenting.
- .10 Tape all joints to provide continuous barrier.

#### 3.4 PENETRATIONS

- .1 Install sheathing paper, membrane, sealants and tape around penetrations as per the details. Lapping requirements at penetrations will vary, refer to details.
- .2 Apply self adhesive membrane as indicated on the details and Section 07 27 13 - Modified Bituminous Sheet Air Barriers.
- .3 Apply sealants as indicated on the details and Section 07 92 00 – Joint Sealants.

#### 3.5 PROTECTION OF FINISHED WORK

- .1 Exterior building envelope finish shall be installed within a two (2) month time period

END OF SECTION





## **1 GENERAL**

### **1.1 SUMMARY**

---

- .1 Work described in this section includes but is not limited to the following:
  - .1 All labour, materials, equipment and services necessary for the application of self-adhesive membrane air barrier, and self-adhesive membrane for windows, doors, and other interfaces.

### **1.2 REFERENCES**

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- .1 ASTM D412 Vulcanized Rubber and Thermoplastic Rubbers and Thermoplastic Elastomers - Tension.
- .2 CGSB 37-GP-9 Primer, Asphalt, Unfilled, for Asphalt Roofing, Damproofing and Waterproofing.
- .3 CGSB 37-GP-15 Application of Asphalt Primer for Asphalt Roofing, Damproofing and Waterproofing.
- .4 CGSB 37.29 Rubber-Asphalt Sealing Compound.
- .5 CGSB 37-GP-56 Membrane, Modified, Bituminous, Prefabricated, and Reinforced for Roofing.

### **1.3 STORAGE AND HANDLING**

---

- .1 Provide and maintain dry, off-ground weatherproof storage.
- .2 Store rolls of membrane in upright position.
- .3 Remove only in quantities for same day use.

### **1.4 ENVIRONMENTAL REQUIREMENTS**

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- .1 Do not install membrane system when ambient temperatures are at or below 5°C for 24 hours before application, and only during dry conditions.
  - .1 Use cold weather products where required by manufacturers guidelines.
- .2 Minimum temperature for installation of primer is 5°C.
  - .1 Use cold weather products where required by manufacturer's guidelines.
- .3 Install membrane on dry substrates, free of snow and ice, use only dry materials and apply only during weather that will not introduce moisture into membrane system.

- .4 If water penetrates through the membrane assembly due to inadequate protection including from interior sources, Contractor to cut and inspect damages, remove and replace all materials at his own cost, to eliminate all trace of water in the assembly.
- .5 Do not allow membrane to remain exposed longer than 6 weeks.

## 1.5 QUALITY ASSURANCE

---

- .1 Applicator: Company specializing in performing the work of this section with minimum two years documented experience. Provide list of previous projects and references upon request by the Departmental Representative.

## 2 PRODUCTS

### 2.1 MEMBRANE

---

- .1 Rubberized asphalt self adhesive membrane to meet the following minimum criteria:
  - .1 Reinforced with a cross laminated polyethylene sheet 4 mils thick.
  - .2 Membrane is to be 40 mils thick (excluding release film) and must have a release film to protect the adhesive surface.
  - .3 The membrane system must not show any signs of softening, flow or deterioration at temperatures 80 °C or below.
  - .4 Acceptable products:
    - .1 Sopraseal Stick 1100, manufactured by Soprema
    - .2 Blueskin SA, manufactured by Monsey Bakor
    - .3 PW 100/40, manufactured by Protecto Wrap
    - .4 Pre-approved alternate.

### 2.2 FOIL FACED MEMBRANE

---

- .1 Foil faced rubberized asphalt self adhesive membrane for use at transitions and penetrations. This includes but is not limited to balcony edges, balcony soffits, scaffolding tie-in points, stucco tie-in points, window perimeters, hose bibs, louver openings and other waterproofing details. Material to meet the following minimum criteria:
  - .1 Membrane is to be 40 mils thick (including release film) and must have a release film to protect the adhesive surface.
  - .2 The membrane system must not show any signs of softening, flow or deterioration at temperatures 80 °C or below.
  - .3 Acceptable products:
    - .1 Soprasolin HD, manufactured by Soprema
    - .2 Protecto Seal 45, manufactured by Protecto Wrap

### 2.3 HT MEMBRANE – BELOW METAL ROOFS AND FLASHINGS

---

- .1 SBS modified bitumen self adhesive membrane to meet the following minimum criteria:
  - .1 Membrane is to be 40 mils thick (including release film) and must have a release film to protect the adhesive surface.
  - .2 The membrane system must not show any signs of softening, flow or deterioration at temperatures 110 °C or below.
  - .3 Acceptable products:
    - .1 Lastobond Shield HT, by Soprema
    - .2 Blueskin PE 200 HT, by Monsey Bakor
    - .3 Approved equivalent.

### 2.4 SELF-ADHESIVE SHEATHING MEMBRANE

---

- .1 A self-adhesive non-perforated, nonwoven, non-absorbing, breathable fabric barrier that resists air flow, bulk water and wind driven rain.
- .2 Physical properties
  - .1 Self-adhesive membrane with laminated polypropylene facer
- .3 Performance Characteristics:
  - .1 Air penetration: Maximum of 0.0025 L/s·m<sup>2</sup> at 75Pa when tested in accordance with ASTM E2178, Type 1 per ASTM 1677.
  - .2 Water Vapour Transmission: Minimum 17 Perms (Imperial) when tested in accordance with ASTM E96, Method B.
  - .3 Tear Resistance: 64 N / 54 N. When tested in accordance with CAN/CGSB 51.32-M89.
  - .4 Water Penetration Resistance: Minimum 280 cm (110 inches) when tested in accordance with AATCC Test Method 127.

### 2.5 ACCESSORIES

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- .1 Primer: High tack SBS rubber based primer: to CGSB 37-GP-9Ma as recommended by manufacturer.
- .2 Mastic sealant: As recommended by the manufacturer.
- .3 Termination bars:
  - .1 Minimum 1.5mm or 18 Ga. for steel, 1/16" (1.2mm) for aluminium
  - .2 G200 galvanized steel or aluminium
  - .3 38 mm (1.5") wide by continuous lengths where possible.
  - .4 Gum lip as required.
- .4 Fasteners: hex-washer head masonry anchor screws complete with organometallic polymer weather-seal thermoset coating
- .5 Metal termination flashings: Refer to 07 62 00 Sheet Metal Flashings and Trim.

- .6 Sealant: Refer to 07 92 00 Joint Sealants.

### **3 EXECUTION**

#### **3.1 EXAMINATION OF SURFACES**

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- .1 Examine surfaces to have membrane installed and immediately inform Departmental Representative in writing of defects.

#### **3.2 PREPARATION**

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- .1 Protect adjacent surfaces not designated to receive membrane.
- .2 Clean and prepare surfaces to receive membrane in accordance with manufacturer's recommendations. Surfaces are to be clean, dry and free of foreign matter.
- .3 Ensure substrate is continuous. Provide solid backing as required. Unsupported membrane of 8 mm or greater is unacceptable. Fill voids as required or reinstall sheathing to meet maximum gap requirement.
- .4 All sharp metal edges to be rounded or smoothed off to prevent puncture of membrane.

#### **3.3 INSTALLATION**

---

- .1 Install membrane in accordance with manufacturer's instructions. Observe temperature and humidity limitations for application.
- .2 The substrate must be clean, sound, free of excess of water and loose materials, grease and any contaminants, which may compromise the performance of the product.
- .3 Prime areas to receive membrane in accordance with manufacturer's recommendations. Primer must be dry prior to application of membrane. Primer is typically required on all surfaces including underlying layers of membrane. Membrane must be applied to primed area that same day.
- .4 Roll out sheets. Discard wrinkled or bubbled membrane.
- .5 Remove release paper layer. Roll out on substrate with a mechanical roller to encourage full contact bond. Use heat gun as required to achieve adequate continuous bond.
- .6 Lap sides and ends in accordance with manufacturer's instructions and with the project details. All laps to be a minimum of 50 mm.
- .7 All exposed laps except shingle laps to be masticed.
- .8 Pre-strip membrane (and sheathing paper) as required to ensure shingle fashion laps at tie-ins.
- .9 Patch deficient areas with membrane extending 150 mm minimum in all direction from affected area. Seal top and sides of patch with mastic.

- .10 Extend membrane onto items protruding to or penetrating assembly and seal termination with mastic.
- .11 Ensure no membrane or membrane accessories extend to future exterior sealant locations or on finished surfaces. Clean any affected areas as required.
- .12 Install termination bars (if required) onto membrane to continuously secure as indicated and directed by Departmental Representative. Fasten as required to provide continuous support of membrane and to eliminate bowing of termination bar (minimum 6" (150 mm) o/c).
- .13 Seal leading edge with mastic at the end of each day's work.

#### 3.4 CLEAN UP AND PROTECTION

- .1 Clean off drips and smears of bituminous material and primers off adjacent materials immediately.
- .2 At end of each day's work, provide protection for completed work and materials out of storage.

END OF SECTION



## 1 GENERAL

### 1.1 REQUIREMENTS INCLUDED

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- .1 Furnish all labour, materials, equipment and services necessary for the design, supply, fabrication and erection of the complete preformed metal panels as indicated on the drawings and as specified.
- .2 The work of this section shall include, but shall not necessarily be limited to the design, engineering, fabrication, supply and erection of the following:
  - .1 Preformed metal wall panels, fascia panels and the like.
  - .2 All necessary connection hardware and supporting members for attachment of the metal panels to the exterior back-up walls, including brackets, clips, channels and the like.
  - .3 All preformed metal panel caps, parapet cap flashings, scuppers and collars, closure strips, hinged electrical outlet covers, and trim required in connection with the above installations.
  - .4 Continuous air barriers and seals, including tie-ins to adjoining systems.
- .3 Include also the following as work to be included in this section:
  - .1 All cutting and flashing required for metal panel penetrations, including electrical outlets, hose bibs, louvers, ducts piping and the like as indicated on the drawings.

### 1.2 QUALITY ASSURANCE

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- .1 Metal panel manufacturer shall have complete in-house production facilities and a minimum of five (5) years experience in manufacturing of architectural metal wall panel systems.
- .2 Installer shall be approved by panel manufacturer and have minimum of five (5) years experience in installation of architectural metal wall panel systems.
- .3 Shop tests are required to ensure dimensional and finish qualities are to specified standards.

### 1.3 PERFORMANCE DOCUMENTS

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- .1 This is a performance specification and is issued in conjunction with the drawings which indicate the general arrangement of the work, the dimensions, and the major architectural and structural elements of construction. As performance documents, the drawings and specifications do not necessarily indicate or describe all items required for the full performance and completion of the work of this section.

#### 1.4 DEFINITIONS

- .1 The term "dry joint system" where used in this section means a metal panel system supported on an anchorage system which is based on the rain screen principle and does not require sealing of exterior joints between panels to be watertight.

#### 1.5 DESIGN RESPONSIBILITY

- .1 The design, engineering, fabrication and erection of the preformed metal panels as required to meet these performance specifications shall be the complete responsibility of this Contractor.
- .2 Design requirements include but are not necessarily limited to the design and sizing of all preformed metal panels, connection hardware including supporting track members, all anchors, fasteners, clips and girts as required for the proper anchorage of the panels to the building structure, even though not indicated on the drawings or specified. Connection hardware shall be of material and design that is compatible with metal panel system.
- .3 The metal panel details shown are included for the purpose of indicating the preferred profiles and dimensions necessary to achieve the design intent and are not intended to eliminate other design proposals. Minimal dimension adjustments to that shown may be made in the proposed design in the interest of fabrication or erection methods or techniques, the weatherability factor, or the ability of the design to satisfy the design and performance requirements specified, provided that the design intent and the intent of the specifications are maintained.
- .4 The Departmental Representative's review of any and all items designated in this specification will be done with the understanding and assurance that this Contractor is fully responsible for the performance of all work covered in this section.

#### 1.6 DESIGN AND PERFORMANCE REQUIREMENTS FOR PREFORMED METAL PANELS

- .1 The following criteria shall be used in design of the preformed metal panel system.
  - .1 The panel system including required stiffeners and connection hardware shall meet the specified requirements for wind loading, air infiltration and exfiltration and water penetration.
  - .2 The anchorage system shall be designed so that the panels are secure yet "free floating", to accommodate expansion and contraction.
  - .3 Design shall provide drainage to the exterior face of wall for any leakage of water occurring at the joints and/or condensation taking place within the construction. System shall not depend on caulking for water tightness. No continuous edge grip system is acceptable. System shall comply with the following tests:



- .1 Air Infiltration: When tested in accordance with ASTM E283-84, air infiltration at 6.24 psf must not exceed .06 cfm per sq.ft. of wall area.
- .2 Water Infiltration: There shall be no uncontrolled water penetration with ASTM E331-83 at a differential static pressure of 10 lbs. after fifteen minutes of testing.
- .3 Structural Performance: Shall be tested in accordance with ASTM E330-84. At 150% of design pressure there shall be no permanent deformation exceeding L/100, for frame and L/60 for material.  
Reference velocity pressure shall be 1 in 10
- .4 The supporting anchorage hardware for “dry joint system” shall have an internal drainage system to catch condensation within the wall and direct it to designated weepage points.
- .5 Cladding panels shall be to sizes indicated. Joint between panels shall be as detailed. No wet or caulked joints will be allowed in the system, other than at tie-ins to adjoining systems.
- .6 All fastenings and connectors shall be concealed.
- .7 Panels, connection and attachment hardware, suspension systems and fasteners shall be designed to accommodate expansion and contraction.
- .8 System shall be designed to accommodate differential slab deflection and lateral interstorey drift as per the following:
  - .1 Differential slab deflection between any two consecutive floors =  $\pm \frac{1}{2}$ "
  - .2 Interior storey drift under seismic conditions in accordance with NBC 1995 =  $\frac{1}{2}$ ". This is based on elastic analysis with force modification factor  $R = 3.5$ . For a realistic value of anticipated deflection under severe seismic conditions, the above interstorey drift shall be multiplied by the R factor (i.e.  $\frac{1}{2}" \times 3.5 = 1 \frac{3}{4}$ ").
  - .3 In addition to the above, panel system shall be designed to allow  $\frac{5}{8}$ " distortion.
- .9 Connection and attachment hardware shall not cause staining to panels or to other adjoining materials.
- .10 Labels and trademarks, including applied labels, shall not be visible on the finished work.
- .11 There shall be no oil canning, warping or buckling of panel faces, including when panels are under full design loads specified. Provide any necessary stiffeners within panels to maintain flat panel surface and prevent oil canning.
- .12 Panel system shall provide and/or make allowances for free and noiseless vertical and horizontal thermal movement, due to the contraction and expansion of any or all component parts of the cladding panels, for an ambient temperature range from  $-18^{\circ}\text{C}$  to  $+60^{\circ}\text{C}$ . Buckling, opening of joints, undue stress on fasteners, failure of sealants or any other detrimental effects due to the thermal movement of any or all component parts will not be accepted. Fabrication, assembly and erection procedures shall take into account the ambient temperature range at the time of the respective operation.
- .13 The deflection of the components of the panel system shall be limited as required to prevent any adverse effects on the

watertight integrity of the system assembly or on any related component.

- .14 Anchorage system for panels shall be designed to provide for removal of panels without disturbing adjacent panels and shall be totally concealed. Anchor assemblies or connection hardware, including all related connections, tracks, girts, fasteners, etc. for and related to the cladding panels shall be designed, engineered, furnished and installed as required for full compliance with the specified design and performance criteria. All such items indicated are schematic and do not necessarily indicate the exact or required scope, type, shape or profile. Location and methods of anchoring panels shall be this Subcontractor's responsibility, who shall design the cladding panels and connections to suit each specific condition in an acceptable manner complying with the requirements specified herein.
- .15 All materials, recommendations and details describing the proposed use, design and application procedures for all anchorage shall be documented and fully described on the shop drawings.

#### 1.7 REFERENCE STANDARDS

- .1 The applicable current and/or latest editions of references and standards as published by the following organizations or agencies, designated by abbreviations in this section, are all to be considered as part of this section. The system and related work shall conform to the applicable requirements of these references and standards unless indicated or specified otherwise.
  - .1 National Building Code of Canada
  - .2 ASTM American Society for Testing and Materials
  - .3 CGSB Canadian Government Specifications Board
  - .4 CSA Canadian Standards Association
  - .5 Canadian Standards Association
  - .6 AAMA Architectural Aluminum Manufacturers Association
    - .1 AAMA 621, "Voluntary Specifications for High Performance Organic Coatings on Coil Coated Architectural Hot Dipped Galvanized (HDG) and Zinc-Aluminum Coated Steel Substrates."

#### 1.8 SHOP DRAWINGS

- .1 Shop Drawings for the preformed metal panels shall be submitted to the Departmental Representative for his review in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Shop drawings shall incorporate plans, all elevations, sections and full size details for all work in this section. Include panel sizes, bow, camber and squareness tolerances. The full size details shall show and specify all metal thicknesses, types and finishes; direction and magnitude of thermal expansion; type of construction including joinery, fasteners and welds; all anchorage assemblies' connections and components; and the fabrication and erection tolerances for the work in this section. Include details of continuity of air/vapour barriers at all tie-ins to adjoining systems.

- .3 Shop drawings shall be sealed by a professional engineer registered in British Columbia.
- .4 No work shall be fabricated until the shop drawings and samples have been reviewed by the Departmental Representative.
- .5 The actual sequencing of such submittal and review shall be scheduled and coordinated to expedite the start of fabrication and allow work to progress to suit the construction schedule.

#### 1.9 SUBMITTALS

- .1 Submit also the following to the Departmental Representative:
  - .1 Submit copies of panel fabricator's current "System Testing" to ASTM E331 and ASTM E283 for air/water infiltration.
  - .2 Submit affidavit certifying material meets requirements specified.
  - .3 Submit two (2) copies of manufacturer's literature specified.
- .2 Test Reports: Fabricator shall furnish above test reports by an accredited testing laboratory that shows compliance with specified provisions. If not previously tested, fabricator must have system tested and furnish necessary reports before final review of shop drawings.
- .3 Letters of Assurance: The Engineer who sealed the shop drawings shall submit to the Departmental Representative the APEG BC Schedule S-B Assurance of Design and Commitment for Field Review. The Engineer who sealed the shop drawings shall provide field review of the installation. On completion of the installation the Engineer shall submit to the Departmental Representative Schedule S-C Assurance of Professional Field Review and Compliance.
- .4 Samples: Submit duplicate colour samples of metal panel finish specified to the Departmental Representative for colour selection. Submit duplicate samples of the panels with specified finish to the Departmental Representative for final approval.
- .5 Sample Panels: Submit sample of preformed metal panel assembly to the Departmental Representative for approval. Panels to be approximately 24" x 24" square showing typical connection hardware, fastening method and finish to be provided.

#### 1.10 PRODUCT DELIVERY, STORAGE AND HANDLING

- .1 Material shall not be exposed to wetting or damage and shall be stored neatly, properly stacked.
- .2 Assembled units and/or their component parts shall be transported, handled and stored in a manner to preclude damage of any nature.
- .3 Remove all units or components which are stained, watermarked, cracked, bent, chipped, scratched or otherwise unsuitable for installation and replace with new.
- .4 Protect finish and edges in accordance with metal cladding panel manufacturer's directions.

- .5 Store material in accordance with panel manufacturer's directions.

#### 1.11 MOCK-UP

- .1 Assemble a full size, mock-up of preformed metal wall panel system on the project site for review and acceptance by the Departmental Representative. Exact number of panels and area for assembly will be determined by the Departmental Representative. Mock-up shall include all components of the system, including typical joints and connection hardware, and typical tie-ins to adjoining systems, all finished as specified.
- .2 Modify the mock-up at no additional cost to the contract as may be required to meet design and performance requirements. When the mock-up has been accepted by the Departmental Representative it shall remain on site as finished part of the Work.

#### 1.12 GUARANTEE

- .1 The work included in this section shall be fully guaranteed by this Contractor in accordance with the requirements of the General Conditions of Contract and the following additional requirements for a period of not less than five (5) years from the date of Substantial Performance of the Work.
  - .1 Panel System: Guarantee that there will be no water penetration through the system.
  - .2 Panels: Guarantee against oil canning or buckling due to thermal movement or building structure deflections.
  - .3 Panel Finish: Guarantee against the following:
    - .1 Excessive Non-Uniformity: Any non-uniform fading during guarantee period, to extent that adjacent panels have a gloss range greater than originally accepted gloss range samples as approved by the Departmental Representative.
    - .2 Pitting or Corrosion: There shall be no pitting or other type of corrosion resulting from natural elements in local atmosphere.
  - .4 Sealants: Guarantee shall state that any installed sealants are guaranteed against:
    - .1 Adhesive or cohesive failure of joints.
    - .2 Sagging or extruding of joints.
    - .3 Staining of surfaces adjacent to joints by sealant or primer by migration through building materials in contact with them.
    - .4 Chalking or visible colour change on surface of the cured sealant materials.

## 2 PRODUCTS

### 2.1 PREFORMED METAL PANELS

- .1 W1 Wall Assembly Panels: Shall be custom fabricated 22 Ga. pre-finished Z275 galvanized sheet steel.
  - .1 Conforming to: ASTM A653M Grade 230.

- .2 Corrugated profile as indicated on wall assembly schedule SCH-0.01
  - .1 7/8" (22mm) total corrugation amplitude.
  - .2 2-5/8" (68mm) spacing between corrugations.
- .2 W2/ W4 Wall Assembly Panels: Shall be custom fabricated 22 Ga. pre-finished Z275 galvanized sheet steel.
  - .1 Conforming to: ASTM A653M Grade 230.
  - .2 Horizontal channel profile
    - .1 1-3/8" (35mm) channel profile.
    - .2 7½" (190mm) wide channels.
- .3 Panel sizes and shapes shall be as indicated. Overall panel thickness shall be as required to meet design and performance requirements specified and panel sizes as indicated.
- .4 Connection Hardware and Support Members: For panels shall be "dry-joint" system fabricated from galvanized steel. Include all necessary stainless steel fasteners for concealed installation.
- .5 Accessory Components, Flashings and Trim: Shall be factory fabricated ready for field assembly of same material and same finish as metal panels.

## 2.2 SUPPORT MEMBERS, FASTENERS/ CONNECTORS

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- .1 The type, size, quantity and spacing of all connectors, supporting track, suspension components, girts, fasteners and other hardware anchorage devices for metal panels shall be as required to suit the specified performance standards.
- .2 Provide thermal break between panels and supports members. Fastening devices between aluminum and aluminum or aluminum and other materials shall be aluminum or stainless steel of type that will not permit staining.
- .3 Self-locking fasteners shall be stainless steel with nylon inserts or patches. Shims shall be metal to match adjacent surfaces. Do not use plastic shims.

## 2.3 FABRICATION AND MANUFACTURE

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- .1 All panels to be formed in accordance with reviewed shop drawings and Industry standards.
- .2 Acceptable Tolerances for preformed metal panels shall be as follows:
  - .1 Bow: Length and/or width maximum 0.8% of the dimension.
  - .2 Squareness: Maximum 4.7 mm on diagonals of panel.
- .3 Panel Dimensions: Allowance for field adjustments as recommended by manufacturer where final dimensions cannot be established by field measurement before completion of shop manufacturing.

- .4 Panel lines, breaks and angles shall be sharp, true and surfaces free from warp or buckle.
- .5 All panels to be formed to specified dimensions with tolerances to accommodate expansion and contraction between panels and structural members.
- .6 All exposed panel edges shall be finished edge wrapped. All panel corners shall be welded and ground smooth prior to finishing.
- .7 Flashings, accessory and trim components shall be factory-fabricated and ready for installation.
- .8 Provide all openings and cut-outs complete with matching panel trim around openings for fireplace exhaust vents, duct vent hood assemblies, light fixtures, outlet boxes, hose bibs, louvres, etc.
- .9 Work shall be carefully fabricated and assembled with proper and approved provision for thermal expansion and contraction, fabrication and installation tolerances and adjoining building component tolerances and design criteria.
- .10 All work shall be true to detail with sharp, clean profiles, straight and free from defects, dents, marks, indentations, waves or flaws of any nature impairing strength or appearance; fitted with proper joints and intersections and with specified finish.

#### 2.4 FINISH

- .1 Exposed Coil-Coated Finish:
  - .1 Two-Coat Fluoropolymer: AAMA 621. Fluoropolymer finish containing not less than 70 percent PVDF resin by weight in color coat. Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions. Dry film thickness of not less than 1.0 mil (0.025 mm) for primer and topcoat.
    - .1 Colour: To be selected from manufacturer's standard range of colours by Departmental Representative. Allow for two colours, one per each wall panel type specified in 2.1.
- .2 All exposed surfaces to be free of visible defects and scratches.
  - .1 Anodized finishes to be continuous, fully sealed and free from powdery surfaces
- .3 Minor scratches and blemishes shall be repairable with the coating manufacturer's recommended product or system. Such repairs shall match the original finish for colour and gloss and shall adhere to the original finish as per the adhesion requirements for the original paint.
- .4 All panels shall be free of scratches and blemishes.
- .5 All exposed surfaces of panels shall have factory applied removable protective film.

### 3 EXECUTION

#### 3.1 ERECTION

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- .1 All erection work shall be the responsibility of the manufacturer and such erection work shall be carried out by the manufacturer's trained erection crews or manufacturer's approved erector, all in accordance with reviewed shop drawings and the manufacturer's specifications and to comply with the intent of the contract documents. Install semi-rigid insulation over face or air barrier membrane behind preformed metal panels as indicated.
- .2 Erect preformed metal wall panel systems plumb, true and level and in proper alignment and relation to established lines and to elevation as shown on reviewed shop drawings.
- .3 Install preformed metal panels at locations indicated on site in accordance with reviewed shop drawings.
- .4 Cooperate with other trades having a bearing on this work, to secure a satisfactory installation.
- .5 Set panels in their correct locations as shown on the reviewed shop drawings, level, square, plumb and of proper elevations and in alignment with other work.
- .6 Install all connection hardware and attachments, clips and anchors, securely fastened to surrounding construction, spaced to afford maximum rigidity.
- .7 The surface of all aluminum coming into contact with concrete or steel shall receive a full bodied coat of an approved bitumastic paint, care being taken to keep this paint off all exposed areas.
- .8 Provide all holes for vents, mechanical and electrical ducts, piping, louvres, etc., penetrating cladding panels. Provide flashings, reinforcing membranes, return legs, and sealant around penetrations as required, to ensure continuous air barrier.

#### 3.2 ERECTION TOLERANCES

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- .1 The panel system shall conform to the following erection tolerances:
  - .1 Maximum offset from true alignment between two abutting panels shall be 0.8 mm.
  - .2 Allowances for the cumulative effect of all tolerances (fabrication, assembly, thermal and erection) must be made to ensure a workmanlike and weatherproof installation.

#### 3.3 ADJUST AND CLEAN

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- .1 Remove and replace any damaged metal panels.
- .2 Upon completion of the work of this section, remove factory applied protective coverings from exposed surfaces, and clean surfaces free of all smears, marks and discoloration. Cleaning shall be in accordance with the requirements of the panel manufacturer. All cleaning materials shall be acceptable to the cladding manufacturer; where doubt exists, make spot tests.

- .3 This Contractor shall be responsible for immediately cleaning off all smears, marks, etc., caused by his own forces during erection of the panels.
- .4 All cleaning requirements and/or recommendations during and after erection shall be coordinated with the Construction Manager.

END OF SECTION



## **1 GENERAL**

### **1.1 SUMMARY**

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- .1 Work includes labour, materials, equipment and services necessary to provide new waterproofing membranes at new R1 and R2 roof assemblies.

### **1.2 REFERENCES**

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- .1 National Building Code of Canada.
- .2 CSA A123.3-M1979 Asphalt or Tar Saturated Roofing Felt.
- .3 CSA A123.4-M1979 Bitumen for Use in Construction of Built-Up Roof Coverings and Dampproofing and Waterproofing Systems.
- .4 Roofing Contractors' Association of B.C., Roofing Practices Manual.
- .5 CGSB 37.50-M89 Hot Applied, Rubberized Asphalt for Roofing and Waterproofing.
- .6 CGSB 37-GP-9Ma Primer, Asphalt, Unfilled, for Asphalt Roofing, Dampproofing and Waterproofing.
- .7 CGSB 37-GP-15M Application of Asphalt Primer for Asphalt Roofing, Dampproofing and Waterproofing.
- .8 37-GP-19M Cement, Plastic, Cutback Tar.
- .9 CGSB 37.29-M89 Rubber-Asphalt Sealing Compound.
- .10 CGSB 37-GP-56M Membrane, Modified, Bituminous, Prefabricated, and Reinforced for Roofing.
- .11 CAN/CGSB-51.20-M87 Thermal Insulation, Polystyrene, Boards and Pipe Covering.
- .12 ASTM D412 Tension Test for Vulcanized Rubber and Thermoplastic Elastomers.
- .13 Guide Specification for Parapro 123 Reinforced Catalyzed Resin Flashing System.

### **1.3 WARRANTY**

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- .1 Two-ply SBS Base and Cap Sheets
  - .1 Provide the Owner with a warranty stating the roof/deck waterproof system shall remain watertight and free from material and workmanship defects for a total of ten (10) years after the final completion date. The warranty shall be a term type, without deductibles or limitations on coverage amount, and shall be issued at no additional cost to the Owner. This warranty shall not exclude random areas of ponding from coverage.
- .2 Prior to shipment of materials to site the Contractor shall make application for warranty to the membrane manufacturer.
- .3 All warranties to commence at Date of Substantial Performance.

- .4 Costs for all warranties to be included in the contract sum.

#### 1.4 LABORATORY TESTING

- .1 If required by Departmental Representative, manufacturers of Elastomeric Asphalt materials to provide, at no cost, the results of tests and chemical analysis on the Elastomeric Asphalt materials supplied.
- .2 Tests are conducted to verify conformance to CGSB 37-GP-56M.

#### 1.5 QUALIFICATIONS

- .1 Roofing contractor is required to submit evidence that the contractor has successfully completed similar work over a period of not less than 5 years.
- .2 The Contractor must be officially recognized as an authorized installer by the waterproofing materials' manufacturer.

#### 1.6 JOB MOCK-UP

- .1 Fabricate, install and pay for mock-ups as required. Mock-ups will be typically used to confirm details and may remain as part of the finished product if deemed acceptable by the Departmental Representative.
- .2 A mock-up plan is required outlining a coordinated review of multiple mock-ups in order to reduce redundant site visits by the Departmental Representative.

#### 1.7 QUALITY ASSURANCE

- .1 Installer Qualifications: Only competent, qualified tradesmen experienced with membranes shall execute the work of this section.
- .2 A crew of qualified tradesmen is defined as follows:
  - .1 The foreman shall hold a three-year Apprenticeship Certificate; at least one other man shall hold a three-year Apprenticeship Certificate; the balance of the crew should have completed some portion of the Apprenticeship program, but shall at least have submitted application for the certification as "Roofers". A Journeyman Certificate is acceptable in lieu of an Apprenticeship Certificate.
  - .2 The foreman and one other member of the crew must have attended an Application Seminar provided by the membrane manufacturer.
- .3 Confirm that surfaces to which modified membrane is to be applied are in a condition suitable for this application. Notify the Departmental Representative in writing if substrate is unacceptable.
- .4 Unless otherwise specified, comply with manufacturer's latest printed instructions for materials and installation methods.
- .5 Notify Departmental Representative in writing of any conflict between these specifications and manufacturers instructions. Departmental Representative will designate which document is to be followed.

### 1.8 SHOP DRAWINGS

- .1 Submit shop drawings in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Submit sloped insulation shop drawings with roof plan indicating slope directions, cricket types and locations.
- .3 Letters of Assurance: The Engineer who sealed the shop drawings shall submit to the Departmental Representative the APEGBC Schedule S-B Assurance of Design and Commitment for Field Review. The Engineer who sealed the shop drawings shall provide field review of the installation. On completion of the installation the Engineer shall submit to the Departmental Representative Schedule S-C Assurance of Professional Field Review and Compliance.

### 1.9 SUBMITTALS

- .1 Submit submittals in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Provide bills of lading to the Departmental Representative, as requested.
- .3 Letter from the proposed primary roof membrane manufacturer confirming that the roof membrane contractor is authorized to install the proposed system.
- .4 Letter from the primary roof membrane manufacturer stating that the proposed application will comply with the manufacturer's requirements in order to qualify the project for the specified warranty.
- .5 Upon completion of the waterproofing work submit executed warranty to Departmental Representative.

### 1.10 STORAGE AND HANDLING

- .1 Deliver and store all materials in their original packaging, bearing the manufacturer's name, related standards and any other specifications or reference standards.
- .2 Store materials out of direct exposure to the elements.
- .3 Store materials delivered in rolls carefully on end, with selvage edges up.
- .4 Store roll goods on a clean, flat and dry surface. All material stored on the roof/deck shall be stored on pallets.
- .5 As required, materials stored on the roof/deck shall be weighted to prevent "blow off" due to wind.
- .6 Store materials on the roof/deck in a manner so as to preclude overloading of roof/deck and building structure.
- .7 Maintain storage location at minimum +5°C.
- .8 Store all materials such as solvents, membranes, adhesives and asphalt cutback products away from open flames, sparks or excessive heat.

- .9 Protect and permanently store all materials in a dry, well-ventilated and weatherproof location. Remove from this location only materials to be used the same day. Cover all material using a breathable cover such as a canvas. Polyethylene or other non-breathable plastic coverings are not acceptable.
- .10 Prevent water-based materials from freezing.
- .11 Place plywood runways or similar over completed work and adjacent assemblies to enable movement of materials and other traffic in order to prevent membrane damage during the course of the work.

#### 1.11 ENVIRONMENTAL REQUIREMENTS

- .1 Install roof membrane on dry substrate, free of water, snow and ice, use only dry materials and apply only during weather that will not introduce moisture into roof/deck waterproofing system.
- .2 Before commencing work, Contractor to ensure that forecasted meteorological conditions shall permit work to be carried out without interruption during the course of the day.
- .3 Do not install roof/deck membrane when temperature remains below +5°C for torch, or an equivalent temperature allowing for wind-chill factor.
- .4 Minimum temperature for solvent-based adhesive is -5°C.
- .5 All exposed areas of the work shall be protected at the end of each working day or during any interruption of work.
- .6 If water penetrates through the assembly due to inadequate protection, Contractor to cut and inspect damages, remove, replace and re-install all materials to eliminate all traces of water in the assembly. All costs to be borne by the Contractor.
- .7 Membrane system must be watertight at end of each shift.

#### 1.12 PROTECTION

- .1 Protect all adjacent surfaces from any damage that may result from the work of this section. This includes the installation of fireguard protection, as required and/or as directed by the Departmental Representative. The roof/deck membrane contractor shall make good any damage resulting from the work.
- .2 When working with Torch Applied Materials:
  - .1 Fire Extinguishers: maintain one cartridge operated type with shut-off nozzle, ULC labeled for A, B and C class protection. Size 2.25 kg on roof/deck per torch applicator, within 10m of torch applicator.
  - .2 A fire watch shall be maintained in conformance with roof/deck membrane contractor's insurance provider after each day's roof/deck waterproofing operations cease or as required to satisfy the requirements for all insurance providers involved with the building and/or the work.
- .3 Provide a written roof/deck fall protection plan in conformance with WorkSafe BC and OH&S Regulations. A copy of the fall protection plan must be available at the workplace before work with a risk of

falling begins. The plan shall include but is not limited to the following:

- .1 A roof/deck plan sketch indicating the fall hazards expected in each work area.
- .2 The fall protection system or systems to be used in each area.
- .3 The procedures to assemble, maintain, inspect, use and disassemble the fall protection system or systems.
- .4 The procedures for rescue of a worker who has fallen and is suspended by a personal fall protection system or safety net, but is unable to effect self rescue.
- .5 Location of nearest medical facility, complete with shortest route directions.
- .4 Protect all adjacent surfaces from any damage that may result from the work of this section. If required, the contractor shall make good any deterioration or damage resulting from his work in progress.
- .5 Protect complete perimeter of the roof and any opening in the roof with guards or guardrails to prevent the possibility of accidents.
- .6 All damage to interior conduit or equipment caused by roofing work shall be repaired at no additional cost to Owners.

#### 1.13 MANUFACTURER'S REPRESENTATIVE

- .1 Manufacturer Requirements:
  - .1 The primary roof waterproofing materials' manufacturer shall provide direct trained company personnel to attend necessary job meetings, perform base sheet and cap sheet inspections and conduct a final inspection upon successful completion of the project.
  - .2 Manufacturer's representative to provide a written copy of the report to the Departmental Representative after each visit to the site.
- .2 Contractor to permit and facilitate access to site and roofs/decks, at all times, by above mentioned manufacturer's representative.

#### 1.14 COMPATIBILITY

- .1 Compatibility between components of the roofing system and adjacent assemblies is essential. Provide written declaration to Departmental Representative stating that materials and components, as assembled in system, meet this requirement.

## **2 PRODUCTS**

### 2.1 SBS MODIFIED BITUMEN MEMBRANE SYSTEMS

- .1 Vapour Barrier Base Ply: Roofing membrane composed of homogeneous SBS modified bitumen with no oxidized asphalt content – reinforcement to be impregnated with SBS modified bitumen). The membrane must also meet the following criteria:

- .1 Thickness (avg) 2.9 mm (ASTM D 5147)
  - .2 SBS content: 11-13%
  - .3 Maximum filler content in elastomeric blend: 35% by weight
  - .4 Low Temperature flexibility at -26°C Pass (ASTM D 5147)
  - .5 Ultimate Elongation (avg) @ 23°C: 50% (ASTM D 5147)
  - .6 Dimensional Stability (max) 0.1% (ASTM 5147)
  - .7 Reinforcement: random fiberglass mat or other meeting the performance and dimensional stability criteria.
  - .8 Top and bottom surfaces: silica parting agent/polyolefin film
  - .9 Compound Stability (Min): 121°C (ASTM 5147)
- .2 Base Ply for Field Areas: Roofing membrane composed of homogeneous SBS modified bitumen with no oxidized asphalt content– reinforcement to be impregnated with SBS modified bitumen. The membrane must also meet the following criteria:
- .1 Thickness (avg) 2.9 mm (ASTM D 5147)
  - .2 SBS content: 11-13%
  - .3 Maximum filler content in elastomeric blend: 35% by weight
  - .4 Low Temperature flexibility at -26°C Pass (ASTM D 5147)
  - .5 Ultimate Elongation (avg) @ 23°C: 50% (ASTM D 5147)
  - .6 Dimensional Stability (max) 0.1% (ASTM 5147)
  - .7 Reinforcement: fiberglass scrim/fiberglass mat or other meeting the performance and dimensional stability criteria.
  - .8 Top and bottom surfaces: silica parting agent/polyolefin film
  - .9 Compound Stability (Min): 121°C (ASTM 5147)
- .3 Base Ply for Field Areas: Roofing membrane composed of homogeneous SBS modified bitumen with no oxidized asphalt – reinforcement to be impregnated with SBS modified bitumen content. The back surface consists of factory applied heat activated stripes combined with an acrylic coating between the stripes maintaining uniform bonding of 50% of the total surface area of the sheet. The membrane must also meet the following criteria:
- .1 Thickness (avg) 2.3 mm (ASTM D 5147)
  - .2 SBS content: 11-13%
  - .3 Maximum filler content in elastomeric blend: 35% by weight
  - .4 Low Temperature flexibility at -26°C Pass (ASTM D 5147)
  - .5 Ultimate Elongation (avg) @ 23°C: 50% (ASTM D 5147)
  - .6 Dimensional Stability (max) 0.1% (ASTM 5147)
  - .7 Reinforcement: fiberglass mat or other meeting the performance and dimensional stability criteria.
  - .8 Top and bottom surfaces: silica parting agent/polyolefin burn-off film
  - .9 Compound Stability (Min): 121°C (ASTM 5147)
- .4 Stripping Ply for Field Areas: Roofing membrane composed of homogeneous SBS modified bitumen with no oxidized asphalt content– reinforcement to be impregnated with SBS modified bitumen. The membrane must also meet the following criteria:
- .1 Thickness (avg) 2.9 mm (ASTM D 5147)
  - .2 SBS content: 11-13%

- .3 Maximum filler content in elastomeric blend: 35% by weight
- .4 Low Temperature flexibility at -26°C Pass (ASTM D 5147)
- .5 Ultimate Elongation (avg) @ 23°C: 50% (ASTM D 5147)
- .6 Dimensional Stability (max) 0.1% (ASTM 5147)
- .7 Reinforcement: fiberglass scrim/fiberglass mat or other meeting the performance and dimensional stability criteria.
- .8 Top and bottom surfaces: silica parting agent/polyolefin burn-off film
- .9 Compound Stability (Min): 121°C (ASTM 5147)
- .5 Cap Sheet Ply and Cap Sheet Stripping Ply: Roofing membrane composed of homogeneous SBS modified bitumen with no oxidized asphalt content– reinforcement to be impregnated with SBS modified bitumen. The membrane must also meet the following criteria:
  - .1 Thickness (avg): 4.1 mm (ASTM D 5147)
  - .2 Thickness at sedge (avg): 3.1 mm
  - .3 SBS content: 11-13%
  - .4 Maximum filler content in elastomeric blend: 35% by weight
  - .5 Low Temperature flexibility at -50°C Pass (ASTM D 5147)
  - .6 Ultimate Elongation (avg) @ 23°C: 90% (ASTM D 5147)
  - .7 Dimensional Stability (max) 0.5% (ASTM 5147)
  - .8 Reinforcement: fiberglass scrim/fiberglass mat or other meeting the performance and dimensional stability criteria.
  - .9 Top and bottom surfaces: No. 11 ceramic granules / polyolefin burn-off film
  - .10 Compound Stability (Min): 121°C (ASTM 5147)
- .6 Waterproofing Accessories:
  - .1 Primer: An asphalt solvent blend designed to prepare metal, concrete and masonry surfaces, to ASTM D41, as supplied by the manufacturer
  - .2 Primer: To be used for self-adhered membranes – a solvent based quick drying high-tack primer specifically designed for manufacturers membrane.
  - .3 Mastic: General purpose mastic composed of SBS modified bitumen, non-asbestos fibres, fillers and petroleum solvents:
  - .4 PMMA Flashing: as supplied by membrane manufacturer, compatible with membrane.
  - .5 Pitch Pocket Filler: Polyurethane pitch pocket system made of pre-fabricated modules of various sizes, with interlocking compounds and solvent-free mastic, composed of two-component urethane and mono-component elastomeric sealant.

## 2.2 ACCESSORY MATERIALS

- .1 Roof Drains:
  - .1 Spun copper drain with cast aluminum grate and membrane clamping ring, c/w blue seal and clamping ring.

- .2 New drain body pipe to sleeve into existing drain pipe whenever possible. Install blue seal where possible to prevent back flow leakage and dissimilar metal contact.
  - .3 All drains are to be set into a 24" x 24" (610mm x 610mm) minimum sump to ensure positive flow to drain assembly.
  - .4 All work to be in accordance to the National Building Code, and the National Plumbing Code of Canada.
- .2 Roof Drains < than 3" (76mm) diameter: Hot welded copper type to suit. Provide multiple o-rings onto drain stem to prevent dissimilar metal contact and to reduce the potential for leakage resulting from backflow. Membrane termination to be sealed with PMMA membrane.
  - .3 Scupper Drains:
    - .1 16oz. Copper, all seams in box scuppers to be hot welded (brazed) and capable of resisting 425 degrees C, c/w clamping ring.
    - .2 Install with minimum 2% slope c/w drip edge.
  - .4 Overflow Scuppers:
    - .1 16oz. Copper, all seams in box scuppers to be hot welded (brazed) and capable of resisting 425 degrees C, c/w PMMA seal at leading edge.
    - .2 Install with minimum 2% slope c/w drip edge.
  - .5 Mechanically Fastened Overlay Board: ½" (13mm) thick fiberglass mat faced, non combustible (per ASTM E136) non structural gypsum core panel. Fasten with 12 - #14 screws and metal stress plates per 4'x8' (1220mm x 2440mm) sheet.
  - .6 Asphaltic Overlay Board (adhered): Non-organic asphalt core sandwiched between two asphaltic saturated fibreglass liners (3/16" thick). Adhere with polyurethane adhesive ribbons at 6" o/c.
  - .7 Roof insulation, tapered package, and insulation adhesive: Reference Section 07 21 00 – Thermal Insulation.
  - .8 Plumbing Vent Flashing (stack): spun aluminum vent stacks with vandal proof aluminum caps. Caps to be riveted to stack to prevent removal. Allow for stack extensions as required to facilitate insulation thickness.
  - .9 Roof Anchor Jack Flashing: Spun aluminum stack jack flashing with EPDM triple pressure grommet seal. Install heat-shrink gasket over grommet seal.
  - .10 Fireguard Tape: Inorganic glass mat reinforcing mat coated with SBS modified bitumen:
    - .1 Thickness: 1.5 mils
    - .2 Width: 6" (152mm)
  - .11 Ceramic Granules: No #11 Ceramic granules matching the granule surfacing of the finish ply
  - .12 Sealant: For sealing SBS membrane leading edges. Single component, paintable, elastomeric tri-polymer sealant primarily



- designed to seal leading edges and small cracks SBS modified bitumen roof membranes,
- .13 Filter Fabric: Industrial synthetic fabric consisting of high density polyethylene tapes coated on one side with low density polyethylene. Filter fabric to contain ultraviolet inhibitors and be suitable for outdoor applications
  - .14 Drain Mat: High strength drainage panel consisting of a high compressive strength polypropylene core (ASTM D 1621) with factory laminated geotextile. Flow rate minimum 5690 L/min/m<sup>2</sup> per ASTM D 4491.
  - .15 Precast Concrete Unit Pavers conforming to CAN3-A231.2-M85 and ASTM C936-82 and meets the following criteria:
    - .1 Uniform in material, colour, size and from one manufacturer.
    - .2 All units sound and free of defects that would interfere with proper placing of unit or impair strength of permanence of construction.
    - .3 Laid in pattern as shown on drawings or as indicated by Departmental Representative.
    - .4 Colours of precast concrete pavers as selected by Departmental Representative from manufacturer's standard colour range.
    - .5 Size: 457x457x40mm
  - .16 Concrete Paver Underlayment: 3/4" (19mm) rubber mat manufactured from recycled materials
  - .17 Roof Ballast: 38mm (1.5") round rock to 12lbs per sqft minimum.

### 3 EXECUTION

#### 3.1 WORKMANSHIP

- .1 Install roof/deck waterproof membrane in accordance with applicable standard in R.C.A.B.C. Roofing Practices Manual, the membrane manufacturer's requirements, or this specification; whichever is more stringent.
- .2 Install primer for asphalt waterproof membrane in accordance with CGSB 37-GP-15M.
- .3 Install waterproofing elements on clean dry substrate in accordance with the manufacturer's written instructions (attached). Where there is a discrepancy between the manufacturers' recommendations and the specifications, the more stringent will govern.
- .4 Waterproofing work shall be scheduled and performed in a sequence such that no component of the assembly is left unprotected when operations are interrupted.

#### 3.2 PROTECTION

- .1 Cover walls and adjacent work where materials are hoisted or used.
- .2 Use warning signs and barriers. Maintain in good order until completion of work.

- .3 Clean off drips and smears of bituminous material immediately.
- .4 Ensure installed membrane is protected during the course of the work. Place plywood runways, or similar, over completed work as required to ensure the movement of materials and other traffic does not damage completed work. Comply with precautions deemed necessary by Departmental Representative.
- .5 At end of each day's work or when stoppage occurs due to inclement weather, provide protection for work areas and materials out of storage. Maintain area in a watertight condition at all times.
- .6 The substrate and wall assemblies are sensitive to heat. Use EXTRA CAUTION and extensive fireguard protection, which is not limited to but includes heat shield or deflectors, mineral wool insulation and fireguard tape. The contractor shall make good any damage resulting from his work in progress at no cost to the Owners.

### 3.3 EXISTING MEMBRANE REMOVALS

- .1 Remove existing assemblies as outlined in project documents (refer to SCH-0.3).

### 3.4 EXAMINATION OF ELEMENTS

- .1 Examine work areas and immediately inform Departmental Representative in writing of any defects.
- .2 Prior to commencement of work ensure:
  - .1 Substrates are firm, straight, smooth, dry, free of snow, ice or frost, and clean of dust and debris.
  - .2 Sweep or vacuum all surfaces, removing all loose aggregate and foreign substances prior to commencement of the roof/deck membrane work.
  - .3 Ensure plywood substrate is adequately sloped to all drain locations to minimize the potential for ponding water.
- .3 Contractor shall inspect and approve substrate condition prior to commencement of work. Commencement of work implies acceptance of the surface condition.

### 3.5 ROUGH CARPENTRY

- .1 Prepare wood surfaces down, as required, to set drains flush to surrounding plywood. Exact location of drains and scuppers to be confirmed on site by Departmental Representative. No cutting of structural members is permitted unless approved by the Departmental Representative.

3.6 MODIFIED  
BITUMINOUS  
MEMBRANE  
SYSTEMS

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- .1 Details of waterproof membrane are for schematic purposes. Membrane systems to be installed in accordance with intent of details, along with manufacturer's recommendations and RCABC guidelines. The most stringent shall apply.
- .2 Use materials in accordance with manufacturer's recommendations.
- .3 Prime all metal to receive direct membrane application. All metal surfaces to receive membrane must be buffed or etched prior to asphalt primer application.
- .4 Remove only as much of the existing roof/deck membrane as can be stripped in with base stripping ply in the same day. At the conclusion of each day's work provide water tight "night seals" that facilitate the continuation of the roof/deck membrane work the next day.
- .5 Wood Framed Substrate- Installation of overlay board: (when adjacent wall assemblies are retained)
  - .1 Torching to wood substrates is not permitted. Install overlay board over horizontal plywood substrate with a minimum of 12 wood deck fasteners and screw plates per sheet. Ensure all joints are sealed with fireguard tape to ensure a safe torch application. Prime the edge of the overlay boards and vertical substrate along the perimeter, as required, to receive the self adhered base sheet fireguard application.
  - .2 Once primer has "flashed", install self adhesive base sheet fireguard stripping around the perimeter of the work area. The self adhesive base sheet fireguard stripping is to extend, as required, onto the vertical surface as is necessary to provide fire protection for retained wall assemblies. Extend self adhesive base sheet fireguard stripping a minimum of 75mm onto the horizontal to serve as fire protection along the base of wall during the torch applied base sheet applications.
- .6 Wood Framed Substrate - Installation of overlay board: (when adjacent wall assemblies are rehabilitated)
  - .1 Torching to wood substrates is not permitted. Install overlay board over entire plywood substrate with a minimum of 12 wood deck fasteners and screw plates per sheet. Extend overlay board up adjacent vertical surfaces. The overlay board is to extend, as required, onto vertical surfaces to act as fireguard during the waterproofing work and facilitate a torch applied base and cap sheet stripping ply installations. Ensure all joints are sealed with fireguard tape to ensure a safe torch application. Upon completion, the extended overlay board and fireguard tape shall be cut off to a minimum of 200 mm above the horizontal finished walking surface of the roof/deck assembly. The completed stripping plies shall be back nailed with HDG fasteners with minimum 1" (25mm) diameter washers at 8" o/c.
- .7 Concrete Substrate

- .1 Install SBS primer for the extent of concrete substrate to receive the base sheet. Provide fireguard protection at perimeters, as required. Ensure primer is dry prior to application of base sheet.
- .8 Installation of vapour barrier base ply sheet
  - .1 Starting at low point of roof, perpendicular to slope, unroll base sheet dry on deck, align, and reroll from both ends. Care must be taken to ensure good alignment of the first roll.
  - .2 Install the base sheet by heating the backside of the membrane roll so that there is a free flowing puddle of asphalt in front of the roll at all times. Ensure there is a minimum bleed out of 1/8" (3mm) at all seams.
  - .3 Terminate base sheet tight to the bottom of vertical returns.
  - .4 Application shall provide a smooth surface without air pockets, wrinkles, fish mouths or tears.
  - .5 Provide gussets over the base sheet at all inside and outside corners. Gusset size to be 4" (100mm) wide x 6" (150mm) long facilitating a 2" (50mm) return on either side of the corner. Extend gusset 2" (50mm) on to horizontal surface.
  - .6 Cut a dog ear angle at the end laps on overlapping selvage edges.
  - .7 Seal T-laps immediately following sheet application by applying pressure with a round nosed trowel.
  - .8 End laps to be staggered a minimum of 36" (300 mm).
  - .9 After installation of the base sheet, check all lap seams.
- .9 Installation of Insulation & Tapered Package:
  - .1 Reference Section 07 21 00 – Thermal Insulation.
- .10 Installation of base sheet ply:
  - .1 Prime existing concrete substrate. Provide fireguard protection, as required. Ensure primer is dry prior to application of base sheet.
  - .2 Starting at low point of roof, perpendicular to slope, unroll base sheet dry on deck, align, and reroll from both ends. Care must be taken to ensure good alignment of the first roll.
  - .3 Install the base sheet by heating the backside of the membrane roll so that there is a free flowing puddle of asphalt in front of the roll at all times. Ensure there is a minimum bleed out of 1/8" (3mm) at all seams.
  - .4 Terminate base sheet tight to the bottom of vertical returns.
  - .5 Application shall provide a smooth surface without air pockets, wrinkles, fish mouths or tears.
  - .6 Provide gussets over the base sheet at all inside and outside corners. Gusset size to be 4" (100mm) wide x 6" (150mm) long facilitating a 2" (50mm) return on either side of the corner. Extend gusset 2" (50mm) on to horizontal surface.
  - .7 Cut a dog ear angle at the end laps on overlapping selvage edges.
  - .8 Seal T-laps immediately following sheet application by applying pressure with a round nosed trowel.
  - .9 End laps to be staggered a minimum of 36" (300 mm).

- .10 Application shall provide a smooth surface without air pockets, wrinkles, fish mouths or tears.
- .11 After installation of the base sheet, check all lap seams on the base sheet.
- .11 Installation of base sheet stripping ply (flashing).
  - .1 Upon the completion of the base ply field membrane, but before application of the second ply, provide membrane flashings at the intersection of the membrane and walls, curbs, and where a vertical member passes through the roof.
  - .2 Ensure that substrates are dry, smooth, even and adequately covered with overlay fireguard protection.
  - .3 At perimeters, install base sheet flashing ply up vertical surfaces a minimum of 200 mm and extend onto the horizontal surface of the roof/deck a minimum of 100 mm.
  - .4 Install a 900 mm by 900 mm base sheet flashing ply at all vents, and other protrusions and penetrations as required.
  - .5 Base sheet stripping to be applied by torch. Warm SBS base sheet prior to application and thoroughly roll vertical applications and seams after application. Ensure laps are fully welded.
  - .6 Lap side joints 75 mm. Stagger laps joints a minimum of 300mm from base sheet field laps.
  - .7 Exert pressure on the flashing sheet during application with a wet sponge, or similar, to ensure complete contact with the wall/roof surfaces to ensure no sags, blisters, fish mouths or wrinkles exist.
  - .8 Membrane manufacturer to review and approve base sheet and base sheet flashing ply installation prior to cap sheet installation.
  - .9 Install base sheet stripping at all drains, scuppers, vents, and other protrusions as required.
  - .10 Membrane manufacturer to review and approve, in writing, base sheet installation prior to cap sheet installation.
- .12 Installation of cap sheet ply:
  - .1 Once the base sheet has been applied and does not show any defects, the cap sheet can then be laid.
  - .2 Cap sheet shall be unrolled starting from the low point on the roof. Cap sheet shall be rerolled from both ends prior to torching. Care must be taken to ensure alignment of the first roll.
  - .3 Cap sheet shall be torch welded in accordance with the recommendations of the membrane manufacturer, to the base sheet membrane. During this application, both surfaces shall be simultaneously melted, forming an asphalt bead that shall be pushed out in front of the cap sheet.
  - .4 Care must be taken not to burn the membranes, and their respective reinforcements.
  - .5 Base and cap sheet seams shall be staggered a minimum of 12" (300 mm).
  - .6 Cap sheet shall have side laps of 90 mm and end laps of 150 mm. Surface granules on end laps shall be embedded prior to

- installation of following sheet. Touch up seams with loose granules.
- .7 End laps to be staggered a minimum of 36" (300 mm).
  - .8 Terminate field cap sheet edges at the base of the retained vertical membrane at the perimeter.
  - .9 Ensure the membranes are properly welded, without air pockets, wrinkles, fish mouths or tears.
  - .10 After installation of the cap sheet, check all lap seams on the cap sheet.
  - .11 During installation, ensure there is a minimum 2mm bleed out at all seams.
  - .12 Membrane manufacturer to review and approve, in writing, cap sheet installation.
- .13 Installation of cap sheet stripping ply (flashing):
- .1 Cap sheet stripping shall be laid in strips one meter wide. Side laps shall be 90 mm, and shall be staggered a minimum of 300 mm from cap sheet laps in order to avoid excessive thickness.
  - .2 Using a chalk line, lay-out a straight line on the cap sheet surface, parallel to deck edge, 150 mm inside roof from the base of the deck corner.
  - .3 Using a torch and round-nosed roofing trowel, embed the surface granules into the heated and soft bitumen, from the chalk line to edge of the cap sheet.
  - .4 Cap sheet stripping shall be torch welded directly on its base sheet proceeding from bottom to top. Torching shall soften the two membranes and ensure a uniform weld.
  - .5 Cap sheet stripping shall be applied from the exterior face to extend across top of curb, down interior vertical surface and on to flat deck a distance of 150 mm, to the extent of area of embedded granules. Cut roll into required lengths and use width of roll (1 meter) down length of roof, maintaining specified 90 mm side laps.
  - .6 Ensure application free of without air pockets, wrinkles, fish mouths or tears.
  - .7 After installation, check all lap seams on the cap sheet.
- .14 Installation of Polymethyl Methacrylate (PMMA) Flashing Resin:
- .1 Install flashing resin as outlined in project documents and in conformance with manufacturers' recommendations.

### 3.7 FIELD QUALITY CONTROL

- .1 The contractor is responsible to notify the Departmental Representative and membrane manufacturer 48 hours prior to the commencement of the work.
- .2 The membrane manufacturer will provide periodic review during the waterproofing applications and submit field reports to the Departmental Representative after each visit.
- .3 The membrane manufacturer is to be notified upon the completion of the waterproofing work.

- .4 All deficiencies are to be corrected.
- .5 Submit executed warranty upon completion of waterproofing work.

### 3.8 CLEANING

- .1 At completion of work, all debris and remaining materials resulting from the work of this Section are to be removed from site in a timely manner.
- .2 Clean all adjacent surfaces affected during the course of work.

END OF SECTION





## 1 GENERAL

### 1.1 SUMMARY

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- .1 Work includes: labour, materials, equipment and services necessary to provide flashings and trim as indicated including: cross cavity, cap, base, window and door head and sill, saddle, roof, counter flashings, gutters and rainwater leaders.

### 1.2 REFERENCES

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- .1 Canadian Sheet Steel Building Institute (CSSBI) S8-2001: Quality and Performance Specification for Prefinished Sheet Steel Used for Building Products.
- .2 AAMA 621 Voluntary Specification for High Performance Organic Coatings on Coil Coated Architectural Hot Dipped Galvanized (HDG) and Zinc-Aluminum Coated Steel Substrates.
- .3 ASTM A792 /A792M Specification for Steel Sheet, Aluminum-Zinc Alloy-Coated by the Hot-Dip Process with a minimum zinc coating designation Z150.
- .4 ASTM A653/653M Specification for Sheet Steel, Zinc-Coated or Zinc-Iron Alloy Coated by the hot dip process, with a minimum zinc coating designation Z275
- .5 ASTM D523 Test Method for Specular Gloss.
- .6 ASTM B32 Specification for Solder Metal.
- .7 Aluminium Association Designation System for Aluminium Finishes.
- .8 Aluminium Association Aluminium Sheet Metal Work in Building Construction.
- .9 CSA B111 Wire Nails, Spikes and Staples.
- .10 CAN/CGSB-93.1 Sheet, Aluminum Alloy, Prefinished, Residential.
- .11 Canadian Roofing Contractors Association (CRCA).
- .12 SMACNA Architectural Sheet Metal Manual.
- .13 CGSB 1-GP-171M, Type 1 Inorganic Zinc Rich Primer
- .14 SSPC Paint 20, Type 1-B Inorganic Zinc Rich Primer
- .15 Roofing Contractors Association of British Columbia (RCABC).
- .16 AISI American Concrete and Steel Institute.

### 1.3 SUBMITTALS

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- .1 Submit duplicate 150 x 150 mm samples of each type of sheet metal material, colour and finish.

- .2 Submit documentation identifying sheet metal source, testing results to specified standards and finish in accordance with Section 01 33 00 – Submittal Procedures.

#### 1.4 MOCK-UPS

- .1 Provide for approval prior to fabrication and installation and as part of the exterior wall assembly, mock-up for review by the Departmental Representative, a sample of each flashing assembly detailed for the project, including cap and through wall flashing, window/door head and sill flashing, base and drip edge flashing and custom flashing fabrications.

#### 1.5 DESIGN REQUIREMENTS

- .1 General: Sheet metal flashing and trim assemblies shall withstand wind loads, structural movement, thermally induced movement, and exposure to weather without failure due to defective manufacture, fabrication, installation, or other defects in construction. Completed sheet metal flashing and trim shall not rattle, leak, or loosen, and shall remain watertight.
- .2 Thermal Movements: Allow for thermal movements from ambient and surface temperature changes to prevent buckling, opening of joints, overstressing of components, failure of joint sealants, failure of connections, and other detrimental effects. Base calculations on surface temperatures of materials due to both solar heat gain and nighttime-sky heat loss.
  - .1 Temperature Change: 120 deg F (67 deg C), ambient; 180 deg F (100 deg C), material surfaces

#### 1.6 WARRANTY ON FINISHES

- .1 Manufacturer agrees to repair finish or replace sheet metal flashing and trim that shows evidence of deterioration of factory-applied finishes within specified warranty period.
- .2 Exposed Panel Finish: Deterioration includes, but is not limited to, the following:
  - .1 Color fading more than 5 Hunter units when tested according to ASTM D 2244.
  - .2 Chalking in excess of a No. 8 rating when tested according to ASTM D 4214.
  - .3 Film Integrity: there shall be no evidence of cracking, chipping, peeling, crazing, spotting, flaking, checking or loss of adhesion.
- .3 Finish Warranty Period: 20 years from date of Substantial Completion.

## 2 PRODUCTS

### 2.1 PREFINISHED SHEET STEEL

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- .1 General: Protect mechanical and other finishes on exposed surfaces from damage by applying strippable, temporary protective film before shipping.
- .2 Base Metal Base Metal to be:
  - .1 Aluminium-zinc coated (Galvalume) steel sheet conforming to the requirements of ASTM A792 (or A792M) with a minimum coating of AZ50(AZM150).
  - .2 24 gauge thickness.
- .3 Exposed Coil-Coated Finish:
  - .1 Two-Coat Fluoropolymer: AAMA 621. Fluoropolymer finish containing not less than 70 percent PVDF resin by weight in colour coat. Prepare, pre-treat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions. Dry film thickness of not less than 1.0 mil (0.025 mm) for primer and topcoat.
- .4 Colour: As selected by Departmental Representative from Manufacturer's standard colour range minimum 30 colours. Both top and underside of flashing exposed to view to be finished with the same colour.
- .5 Concealed Finish: Pre-treat with manufacturer's standard white or light-coloured acrylic or polyester backer finish, consisting of prime coat and wash coat with minimum total dry film thickness of 0.5 mil (0.013 mm).

### 2.2 ACCESSORIES

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- .1 Isolation coating: alkali resistant bituminous paint.
- .2 Washers: of same material as sheet metal, 1 mm thick with rubber packings.
- .3 Touch-up paint: as recommended by prefinished material manufacturer.
- .4 Cleats, clips, and splice plates: of same material, coating, and temper as sheet metal, minimum 50mm wide. Thickness same as sheet metal being secured.
- .5 Fasteners:
  - .1 Into wood:
    - .1 Steel pan head screws with coarse thread for wood.
      - .1 #8 x 1" (4.2mm x 25mm) minimum long stainless steel suitable for metal flashing application. Stainless to be 300 Series when exposed otherwise 300 or 400 Series is acceptable.
      - .2 For exposed conditions use hex-head stainless steel screws, with neoprene washer, hex heads coloured to match flashing.

- .2 Into masonry, concrete, stone:
  - .1 One-piece steel screw set into predrilled hole in concrete or masonry for medium duty connections.
    - .1  $\frac{1}{4}$ " (6mm) diameter x 1-3/4" (44mm) long stainless steel conforming to AISI Type 410 (SS410). Hex head for easier installation, Philips head for softer materials such as concrete block. Provide stainless steel washers to hold metal securely. Minimum 5/8" (16mm) diameter. For exposed conditions, provide stainless steel washer with bonded neoprene gasket.
    - .2 Steel pan head screws with stainless steel washers set into plastic plugs predrilled into concrete or masonry for lighter duty connections. Plastic plug version is required in softer materials such as brick or stucco.
      - .1 #8 x 1" (4.2mm x 25mm) long stainless steel pan head screws with 5/8" (16mm) diameter stainless steel washers. For exposed conditions, provide washers with bonded neoprene gaskets. Stainless to be 300 Series when exposed otherwise 300 or 400 Series is acceptable.
      - .2 Plastic plugs: 1-1/8" (28mm) long Nylon-6 material, collar-free design and internal screw-stop
- .3 Into sheet steel:
  - .1 Steel pan head screws with fine thread for metal. Can be self-tapping or self-drilling.
    - .1 #8 x 1/2" (4.2mm x 13mm) minimum long stainless steel suitable for metal flashing application. Stainless to be 300 Series when exposed otherwise 300 or 400 Series is acceptable.
    - .2 For exposed conditions use pan head stainless steel screws, with neoprene washer, heads coloured to match flashing.
  - .4 Into structural steel (non-exposed): Self drilling screws, corrosion resistant capable of salt spray testing per ASTM B117 providing 2000 hours red rust and 30 cycles Kesternich SO<sub>2</sub>.
    - .1 Provide washers to match the screw coating or stainless. In exposed conditions, provide washers with bonded neoprene gaskets. Minimum 5/8" (16mm) diameter washers.
- .6 Perforated aluminum vented closure:
  - .1 Unfinished 0.040" aluminium break-shape.
  - .2 Perforation: 50% open.
- .7 Solder: to ASTM B32 Standard Specifications for Metal Solders
- .8 Touch-up paint: as recommended by prefinished material Manufacturer.

### 2.3 GUTTERS & RAINWATER LEADERS

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- .1 Gutters & Rainwater Leaders: pre-coated sheet steel, 23Ga reinforced complete with gasket seal at every gutter to gutter connection and corner to gutter connection
  - .1 Coating system to finish gutters and rainwater leaders to consist of a polyester resin paint over a primer coating, passivation layer and G90 zinc coating. Coating to be present inside crimp connections and inside pipe components.
- .2 Fasten gutters to fascia support at 18" (457mm) on centre or less. Fasten rainwater leaders to wall at 6 foot (1800mm) on centre or less.
- .3 Gutters to be internally reinforced to resist ice and snow.
- .4 Slope, location of expansion joints, fastening system: design gutters to conform with Chapter 1 - "Roof drainage Systems" SMACNA Architectural Sheet Metal Manual.
  - .1 Provide all goosenecks, outlets, strainer baskets, connectors to existing storm drainage system, and necessary fastenings.
  - .2 Form 600 x 600 mm splash pans from 22ga prefinished steel

## 3 EXECUTION

### 3.1 FABRICATION

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- .1 Fabricate metal flashings and sheet metal work other than aluminium in accordance with applicable CRCA 'FL' series details and SMACNA Architectural Sheet Metal Manual.
- .2 Fabricate aluminium flashings and other sheet aluminium work in accordance with Aluminium Association Aluminium Sheet Metal Work in Building Construction.
- .3 Form pieces in 2400 mm maximum lengths. Make allowance for expansion at joints. Use maximum length sections possible to minimize joints.
- .4 Hem exposed edges on underside 12 mm. Mitre and seal corners with sealant.
- .5 Form sections square, true and accurate to size, free from distortion and other defects detrimental to appearance or performance.
- .6 Apply isolation coating to metal surfaces to be embedded in concrete or mortar.
- .7 Form joints between lengths of flashing sections with standing seams whenever possible. S-locks can only be used if approved by the Departmental Representative.
- .8 All exposed or visible metal flashing and trim to be finished in selected colour as indicated including exposed rear faces of end dams, joints, etc. No exposed or visible steel or aluminium flashing work to be unfinished.

- .9 Fabricate custom flashing details and saddles to minimize solder joints.
- .10 Install sealant at flashing joints.
- .11 Metal Flashings including window / door head and sill flashing, through wall flashing, drip edge flashing, base flashing, etc.
  - .1 Form all flashing surfaces as shown on drawings. Minimum slope of 1 in 4 to the exterior to be used where not shown.
  - .2 Form flashings, copings and fascias to profiles indicated.
- .12 Reglets and Cap Flashings
  - .1 Prefinished sheet metal as detailed and in accordance with RCABC Roofing Practices Manual and SMACNA Architectural Sheet Metal Manual details. Provide slotted fixing holes and hot dipped galvanized steel/plastic washer fasteners.
- .13 Metal Vents
  - .1 Form all metal vents to profiles indicated.
  - .2 Fully solder to continuously seal corners and connections.
  - .3 Paint unfinished steel in accordance with Section 09 90 00 – Painting and Coating.
- .14 Custom flashing fabrications
  - .1 Shop fabricate custom flashing as indicated.
  - .2 Form custom flashing fabrications to minimize the number of metal seams and joints. Whenever possible form flashing with standing or bread pan seams.
  - .3 Use clinched joints whenever possible to avoid soldering.
  - .4 Soldered joints must be preapproved by the Departmental Representative.
    - .1 Fully solder joints.
    - .2 Neutralize solder flux with neutralizing bath prior to painting.
  - .5 Paint off site after fabrication to colour specified. Type and method of paint application must be preapproved by the Departmental Representative. Paint must be a baked on finish application after fabrication.

### 3.2 INSTALLATION

- .1 Install sheet metal work in accordance with RCABC details, SMACNA Architectural Sheet Metal Manual and Aluminium Sheet Metal Work in Building Construction as shown.
- .2 Use concealed fastenings except where approved before installation.
- .3 Provide underlay under sheet metal as required. Secure in place and lap underlayment joints 100 mm.
- .4 Counter-flash bituminous flashings at intersections of roof with vertical surfaces and curbs. Flash joints using S-lock and standing seams forming tight fit over hook strips.
- .5 Lock end joints and caulk with sealant.

- .6 Install surface mounted reglets true and level, and caulk top of reglet with sealant.
- .7 Install head and sill flashings at windows and doors in one continuous piece wherever possible.
- .8 Install flashings lapped "shingle" style with membranes to divert water to the exterior.
- .9 Install all flashings so that all surfaces have a minimum slope of 1:4 to the exterior.
- .10 Cross Cavity Wall Flashings
  - .1 Fit flashings together so that one end of each section is free to move in the joint.
  - .2 Provide end dams when flashings terminate. Caulk end dam to flashing and adjacent material to make watertight.
  - .3 Provide crickets where required to divert moisture to the exterior face of cladding assemblies.
  - .4 Cross cavity flashings typically act as head flashings at windows. Separate flashings required at doors and some window locations.
- .11 Gutters and rainwater leaders
  - .1 Install gutters and secure to building at 300 mm on centre with gutter screws through spacer ferrules. Slope gutters to rainwater leaders as required in Table 1-4 of the SMACNA Architectural Sheet Metal Manual. Provide closure flashing just above gutters to hide exposed eave membrane.
  - .2 Provide welded aluminium scupper pipe extensions to the end of the gutters to permit the collected water to spill beyond the building face as detailed.
  - .3 Install debris deflectors at gutters.
  - .4 Install splash pads at all downpipes that are not connected to drainage piping.
- .12 Metal vents
  - .1 Install metal vents as indicated.
- .13 Scuppers
  - .1 Install scuppers as indicated. To secure scupper in oversized cored holes use 2-part epoxy.
- .14 Custom flashing fabrications
  - .1 Install custom soldered flashing fabrications as indicated.

END OF SECTION





## 1 GENERAL

### 1.1 SUMMARY

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- .1 Work includes provision of sealants and related accessories including:
  - .1 Preparing joint surfaces.
  - .2 Primers and joint backing.
  - .3 Installation of sealants in interior and exterior joints, around items penetrating structure, and other applications to allow expansion, contraction, and other movement while protecting against intrusion of water, air, and foreign matter.
  - .4 Tooling sealant joints and cleaning adjacent surfaces.

### 1.2 REFERENCES

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- .1 CAN/CGSB-19.24 Multi-component, Chemical Curing Sealing Compound
- .2 CAN/CGSB-19.13, Sealing Compound, One Component, Elastomeric, Chemical Curing.
- .3 ASTM C 1193, Standard Guide for Use of Joint Sealers
- .4 ASTM C920 Standard Specification for Elastomeric Joint Sealants
- .5 Sealant, Waterproofing and Restoration Institute, Sealants: The Professional Guide

### 1.3 SAMPLES

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- .1 Prior to starting the work contractor shall submit:
  - .1 Manufacturer's product data and specifications for each sealant required.
  - .2 Sealant manufacturer's project recommendations stating recommended surface preparation for each substrate, and type of primer required (if necessary) for proposed sealant.
  - .3 Submit samples of each type of material and colour.

### 1.4 MOCK-UPS

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- .1 Construct mock-up of each typical condition to show location, joint preparation, colour, size, shape and depth of joints complete with back-up material, primer, caulking and sealant. Typical conditions include but are not limited to window perimeters and stucco joints. Mock-up may be part of finished work.
- .2 Provide 48 hours notification to Departmental Representative and sealant manufacturer prior to application of mock-up for review. Cured adhesion and application to be reviewed by Departmental Representative and manufacturer before proceeding with sealant work.
- .3 Manufacturer to review mock-ups as required.

## 1.5 ENVIRONMENTAL AND SAFETY REQUIREMENTS

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- .1 Comply with requirements of Workplace Hazardous Materials Information System (WHMIS) regarding use, handling, storage, and disposal of hazardous materials; and regarding labelling and provision of material safety data sheets acceptable to WCB.
- .2 Conform to manufacturer's recommended temperatures, relative humidity, and substrate moisture content for application and curing of sealants including special conditions governing use.

## 2 PRODUCTS

### 2.1 SEALANT MATERIALS

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- .1 Sealants acceptable for use on this project to be listed on CGSB Qualified Products List issued by CGSB Qualification Board for Joint Sealants. Where sealants are qualified with primers use only those primers.

### 2.2 SEALANT MATERIAL DESIGNATIONS

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- .1 Interior Sealant
  - .1 Type 1:
    - .1 Interior perimeter seal of windows and doors and other self adhesive membrane applications: To bond aggressively to self adhesive membrane at openings. The bond is to be confirmed by Contractor, Manufacturer and Departmental Representative prior to any interior sealant work proceeding. Colour to match adjacent finish and to be selected by the owner from the range of manufacture's standard colours.
    - .2 Acceptable products:
      - .1 Dow Corning 790 with P5200 primer.
      - .2 Pre-approved equivalent
  - .2 Type 2:
    - .1 Acrylic sealant for interior finish. Confirm compatibility with finish. Colour to match adjacent finish and to be selected by the owner from the range of manufacturer's standard colours.
    - .2 Acceptable products:
      - .1 Tremco 555
      - .2 Dap – Dynaflex 230
      - .3 Pre-approved equivalent
  - .3 Type 3 Exterior Joints:
    - .1 Single component neutral cure silicone to CAN/CGSB 19.13, colour to match adjacent finish and to be selected by the owner from the range of manufacturer's standard colours.
    - .2 Acceptable materials:

- .1 Dow Corning 795 (where both sides consist of non-porous surfaces)
- .2 Dow Corning 790 (where both sides consist of cementitious substrates)
- .3 Dow Corning 758 (where one or both sides consist of woven or spun-bonded air barrier sheet material)
- .4 Tremco Spectrum 2
- .5 Tremco Spectrum 3 low modulus
- .6 Pre-approved equivalent
- .4 Type 4: Gutter applications
  - .1 Tremco Gutter Seal
  - .2 Pre-approved equivalent
- .5 Type 5: Fireplace sealant:
  - .1 High heat silicone
  - .2 Acceptable materials
    - .1 G.E. IS806
- .2 Primer: as recommended by manufacturer.
- .3 Preformed Compressible and Non-Compressible back-up materials.
  - .1 Backer Rod:
    - .1 Compressible closed cell standard foam backer rod (hard) for use with all types of sealants not requiring curing from backside.
    - .2 Compressible closed and open cell foam backer rod (soft) for use with all types of sealants not requiring curing from the backside and not in joints that are subject to submergence. Rod must not be susceptible to outgassing if cut.
    - .3 Open cell foam backer rod for use with any sealant type requiring curing from backside such as double sealed joints. Do not use in joints subject to submergence in water.
    - .4 Size: oversize 30 to 50%.
  - .2 Refer to the Sealant Manufacturer for specific products that are recommended with their sealants.
  - .3 Bond Breaker Tape.
    - .1 Polyethylene bond breaker tape that will not bond to sealant

### 2.3 SEALANT SCHEDULE

1. Sealant and primer selection to be approved by the Departmental Representative and manufacturer during mock-ups prior to the undertaking of the work.
2. Interior perimeter sealant joints of windows and doors: Type 1
3. Seal interior finish joints: Type 2.
4. Foil faced self adhered membrane transition flashings and termination bars: Type 3.
5. Perimeters of exterior openings where frames or penetrations meet exterior facade of building: Type 3

6. Exterior cladding interfaces with other materials –Type 3
7. Self adhered membrane to urethane membrane transitions:  
Type 3
8. Sealant joints in gutter and rainwater leaders. Type 4
9. Fireplace vents: Type 5.

#### 2.4 JOINT CLEANER

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

### **3 EXECUTION**

#### 3.1 PROTECTION

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

#### 3.2 PREPARATION OF JOINT SURFACES

- .1 Examine joint sizes and conditions to establish correct depth to width relationship for installation of backup materials and sealants.
- .2 Clean bonding joint surfaces of harmful matter substances including existing sealants, dust, rust, oil grease, and other matter that may impair work.
- .3 Do not apply sealants to joint surfaces treated with sealer, curing compound, water repellent, or other coatings unless tests have been performed to ensure compatibility of materials. Remove coatings as required.
- .4 Ensure joint surfaces are dry and frost free.
- .5 Examine joint sizes and correct as required to allow for anticipated joint movement and to achieve proper width/depth ratio per manufacturer's recommendation for specified sealant.
- .6 Where necessary to prevent staining, mask adjacent surfaces prior to priming and caulking.
- .7 Prepare surfaces in accordance with manufacturer's recommendations.

#### 3.3 BACKUP MATERIAL

- .1 Install joint filler to consistently achieve correct joint depth and shape, with approximately 30% compression. Install backer rod without stretching, twisting, braiding or puncturing its outer skin. For high heat locations use high heat resistant foam backer rod.
- .2 Apply bond breaker tape where required and to manufacturer's instructions.

#### 3.4 PRIMING

- .1 Where necessary to prevent staining, mask adjacent surfaces prior to priming and caulking.

- .2 Prime sides of joints in accordance with sealant manufacturer's instructions immediately prior to caulking.
- .3 Prime only as much area as can be sealed in the same day.

### 3.5 MIXING

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

### 3.6 APPLICATION

- .1 Sealant.
  - .1 Apply sealant as detailed and in accordance with manufacturer's written instructions.
  - .2 Mask edges of joint where irregular surface or sensitive joint border exists to provide neat joint.
  - .3 Apply sealant in continuous beads.
  - .4 Apply sealant using gun with proper size nozzle.
  - .5 Use sufficient pressure to fill voids and joints solid.
  - .6 Form surface of sealant with full bead, smooth, free from ridges, wrinkles, sags, air pockets, embedded impurities.
  - .7 Tool exposed surfaces before skinning begins to ensure firm full contact at joint interfaces, to give slightly concave and uniform shape free of ridges, wrinkles, sags, air pockets and embedded impurities. Care must be taken when using tooling aids to prevent contamination of substrates and sealant.
  - .8 Minimum exterior sealant joint width to be  $\frac{3}{8}$  inch (9mm), with minimum sealant depth to be  $\frac{1}{4}$  inch (6mm).
  - .9 Minimum exterior fillet beads to be  $\frac{3}{8}$  by  $\frac{3}{8}$  inch (9mm x 9mm), with bond breaker used at all exterior joint locations.
  - .10 Remove excess compound promptly as work progresses and upon completion.
  - .11 Remove masking tape immediately after tooling of joints.
- .2 Curing.
  - .1 Cure sealants in accordance with sealant manufacturer's instructions.
  - .2 Do not cover up sealants until proper curing has taken place.
- .3 Cleanup.
  - .1 Clean adjacent surfaces immediately and leave work neat and clean.
  - .2 Remove excess and droppings, using recommended cleaners as work progresses.
- .4 Field Quality Control:
  - .1 Perform adhesion tests in accordance with manufacturer's instructions and ASTM C1193 Method A, Field-Applied Sealant Joint Hand-Pull Tab.
    - .1 Perform 2 tests per building elevation minimum.
    - .2 For sealant applied between dissimilar materials, test both sides of joint.

- .3 Sealants failing adhesion test shall be removed, substrates cleaned, sealants re-installed, and re-testing performed.

END OF SECTION

## 1 GENERAL

### 1.1 SUMMARY

- .1 Work included: Work includes labour, materials, equipment and services for design, supply and installation of new windows, swing doors, flashings and supports, as indicated.

### 1.2 REFERENCE

- .1 Current editions in effect at time of tender:
  - .1 Building Codes
    - .1 National Building Code of Canada 2015.
  - .2 Structural Design Standards
    - .1 CAN3-S157-M83 (R2001) Strength Design in Aluminum
    - .2 CAN/CGSB-12.20-M89 Structural Design of Glass for Buildings
  - .3 Product Evaluation Standards
    - .1 AAMA/WDMA/CSA 101/I.S.2/A440-11, NAFS—North American Fenestration Standard/Specification for windows, doors and skylights (NAFS-11)
    - .2 CSA A440S1-09, Canadian Supplement to AAMA/WDMA/CSA 101/I.S.2/A440-08, NAFS – North American Fenestration Standard/Specification for Windows, Doors, and Skylights
    - .3 CAN/CSA-A440.2-09/A440.3-09 - Fenestration energy performance/User guide to CSA A440.2-09, Fenestration energy performance
    - .4 NFRC 100 -2010, Procedure for Determining Fenestration Product U-factors
    - .5 NFRC 200 -2010, Procedure for Determining Fenestration Product Solar Heat Gain Coefficient and Visible Transmittance at Normal Incidence
  - .4 Glass Standards
    - .1 CAN/CGSB-12.1-M90 Tempered or Laminated Safety Glass
    - .2 CAN/CGSB-12.3-M91 Flat, Clear Float Glass
    - .3 CAN/CGSB-12.8-M97 Insulating Glass Units
    - .4 ASTM C1376-10, Standard Specification for Pyrolytic and Vacuum Deposition Coatings on Flat Glass
    - .5 ASTM C1048-12e1, Standard Specification for Heat Strengthened and Fully Tempered Flat Glass
    - .6 ASTM C1172-09e1, Standard Specification for Laminated Architectural Flat Glass
  - .5 Installation Standards
    - .1 CAN/CSA-A440.4-07 (R2012) - Window, Door, and Skylight Installation
  - .6 Finishing Standards

- .1 AAMA 613-13 Voluntary Performance Requirements and Test Procedures for Organic Coatings on Plastic Profiles
- .2 AAMA 614-13 Voluntary Specification, Performance Requirements and Test Procedures for High Performance Organic Coatings on Plastic Profiles
- .3 AAMA 615-13 Voluntary Specification, Performance Requirements and Test Procedures for Superior Performing Organic Coatings on Plastic Profiles
- .7 Manuals of Recommend Practice
  - .1 IGMA TM-3000-90(04) North American Glazing Guidelines for Sealed Insulating Glass Units for Commercial & Residential Use
  - .2 2010 Glazing Systems Specifications Manual, by the Glazing Contractors Association of B.C.
- .8 Laboratory Test Methods
  - .1 ASTM E283 - 04(2012) Standard Test Method for Determining Rate of Air Leakage Through Exterior Windows, Curtain Walls, and Doors Under Specified Pressure Differences Across the Specimen
  - .2 ASTM E330 - 02(2010) Standard Test Method for Structural Performance of Exterior Windows, Doors, Skylights and Curtain Walls by Uniform Static Air Pressure Difference
  - .3 ASTM E331 - 00(2009) Standard Test Method for Water Penetration of Exterior Windows, Skylights, Doors, and Curtain Walls by Uniform Static Air Pressure Difference
  - .4 ASTM E547 - 00(2009) Standard Test Method for Water Penetration of Exterior Windows, Skylights, Doors, and Curtain Walls by Cyclic Static Air Pressure Difference
- .9 Field Test Methods
  - .1 ASTM E783 - 02(2010) Standard Test Method for Field Measurement of Air Leakage Through Installed Exterior Windows and Doors
  - .2 ASTM E1105 - 00(2008) Standard Test Method for Field Determination of Water Penetration of Installed Exterior Windows, Skylights, Doors, and Curtain Walls, by Uniform or Cyclic Static Air Pressure Difference
  - .3 AAMA 502-12 - Voluntary Specification for Field Testing of Newly Installed Fenestration Products
- .10 Other Standards
  - .1 GANA 01-300 Proper Procedures for Cleaning Architectural Glass Products
  - .2 CAN/CGSB-2.55-97 Glass Cleaner
  - .3 AAMA 609 & 610-09 Cleaning and Maintenance Guide for Architecturally Finished Aluminum
  - .4 AAMA CW-10-12 Care and Handling of Architectural Aluminum from Shop to Site



1.3 DESIGN AND  
PERFORMANCE  
REQUIREMENTS

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- .1 Products shall comply fully with Canadian Supplement CSA A440S1-09 material, quality and testing requirements.
- .2 Products shall comply fully with NAFS-11 material, quality and testing requirements for Product Class CW PG30.
  - .1 Canadian air infiltration/exfiltration:
    - .1 Operable sash: A3 level
    - .2 Non-operable: Fixed level
  - .2 Water penetration resistance test pressure: 330 Pa.
  - .3 Wind Load Resistance: Design and manufacture products to meet building code wind loads for the building height and location. Deflection of all glass supporting members to be limited to L/175.
- .3 Products shall have the following forced entry resistance:
  - .1 NAFS-11 Grade 10 or greater.
- .4 Products shall comply with the energy performance requirements of the National Building Code of Canada, Part 9.36:
  - .1 Windows and sliding glass doors: maximum U-value  $\leq 1.8$  W/(m<sup>2</sup> x K)
  - .2 Fully glazed hinged and bi-folding doors with uninsulated vinyl, metal or fiberglass frames: maximum U-value  $\leq 1.8$  W/(m<sup>2</sup> x K)
  - .3 Side hinged doors of solid wood or insulated panel construction have no U-value requirement provided:
    - .1 Insulation is rated to a thermal resistance (RSI)  $\geq 0.875$  (m<sup>2</sup>xK)/W
    - .2 Glazing in manufactured door slabs, sidelites and transoms of wood or insulated doors must be multiple glazed with at least one low-E coating, a 90% argon gas fill level, have warm edge spacers and a compatible edge sealant system.
- .5 Structural Design:
  - .1 Design glass, framing members, and anchorage to the requirements of the 2015 National Building Code of Canada for wind, seismic, guard, and human impact loads.
  - .2 Allow for deflection of building structure. Ensure no structural loads are imposed on windows, sliding doors or swing doors
  - .3 Engage Registered Professional Engineer to review structural design and attachment to building structure, seal shop drawings, carry out field reviews, and submit sealed letter of assurance stating that the window and door installation conforms to sealed shop drawings.
- .6 Durability
  - .1 The required life expectancy of the window assemblies is a minimum of 20 years. It is expected that with adequate maintenance, the windows will maintain the air tightness, water

tightness, and structural performance requirements over their expected life. For the purpose of assessing durability, the field tested air and water leakage performance of the fenestration products shall be not less than that specified for laboratory testing.

#### 1.4 FIELD MEASURE

- .1 Contractor and window manufacturer to field measure typical openings prior to preparing shop drawings and fabrication. The Contractor is responsible to ensure that new windows are correctly sized for existing openings.
- .2 The Contractor will be responsible to match existing fenestration patterns including size, location and swing direction of operable vents and doors. Where hardware limitations require modifications to the fenestration patterns or sizes, notify the Departmental Representative in writing of the required changes and indicate changes on the shop drawings

#### 1.5 SHOP DRAWINGS

- .1 Submit shop drawings in accordance with Section 01 33 00 – Submittal Procedures.
- .2 Show scale elevations, sections, dimensions, and quantity of units. Indicate rough opening requirements and maximum tolerances of adjacent construction.
- .3 Provide full-scale details of all perimeter and interface conditions that integrate design intent on Contract Documents.
- .4 Show relationship to other work, including attachment of flashings, air and water barriers, and location of caulking. Show extrusions profiles and engagement of glass and infill materials.
- .5 Show methods of structural reinforcement and attachment to building, including provisions for thermal movement and building movements. Identify all structural fasteners.
- .6 Schedule glass types and sealed unit makeup. Identify finishes, sealants, location of isolation coatings, and any other information required to indicate compliance with Contract documents.
- .7 Submit shop drawings under seal of Registered Professional Engineer in the Province of British Columbia.
- .8 Letters of Assurance: The Engineer who sealed the shop drawings shall submit to the Departmental Representative the APEGBC Schedule S-B Assurance of Design and Commitment for Field Review. The Engineer who sealed the shop drawings shall provide field review of the installation. On completion of the installation the Engineer shall submit to the Departmental Representative Schedule S-C Assurance of Professional Field Review and Compliance.

## 1.6 SUBMITTALS

- .1 Submit shop drawings in accordance with Section 01 33 00 – Submittal Procedures.
- .2 Submit all documentation and samples for review by Departmental Representative at one time, prior to fabrication window and door products.
- .3 Quality Control Documents
  - .1 Submit copies of test reports to establish that the products assembled by this manufacturer comply with the specified Performance Class, Performance Grade, Water Test Pressure, and Air Infiltration/Exfiltration Level as tested to NAFS-11 and the Canadian Supplement. Submit complete test reports showing all component drawings.
  - .2 Submit insulating glass fabricator's IG certifications for edge constructions used for the glass on this project.
  - .3 Submit letter from glazing contractor and product manufacturer confirming that all products will be supplied and installed according to the descriptive and performance requirements of this specification. Identify any specified requirements that are in error or cannot legitimately be met, and provide alternatives which meet the intent of the specification for the Departmental Representative's approval.
- .4 Samples
  - .1 Submit colour samples of specified finishes
  - .2 Submit samples of materials requested without cost to the owner (metal, glass, fasteners, frame sections, hardware).
  - .3 Submit a sample window (1m x 1m) showing typical operable unit and fixed unit combination window.
- .5 Maintenance Manual
  - .1 Submit a detailed maintenance manual covering the following for the expected life of the windows:
    - .1 All maintenance required in order to achieve the expected durability. Include requirements for maintenance and cleaning of finishes, glazing units, window operating hardware, internal and external sealants, and gaskets.

## 1.7 QUALITY ASSURANCE

- .1 Submit all documentation specified to show that all products meet or exceed the requirements of this specification.
- .2 Products shall be delivered to the jobsite with labels showing conformance with:
  - .1 The BC Energy Efficiency Standards Regulation. Labels must be factory applied and bear the trade mark of one of the following energy performance certification agencies: CSA, Intertek, QAI, or inspection agencies authorized by NFRC.
    - .1 Windows and sliding glass doors:

- .2 Glazed doors with vinyl or fiberglass frames:
- .3 Insulated doors:
- .4 Wood doors:
- .2 NAFS-11 and the Canadian Supplement CSA A440S1-09 and with the Performance Class, Performance Grade, Water Test Pressure, and Air Infiltration/Exfiltration levels of this specification. Labels may be factory applied or alternatively the label information may be presented on the cover sheet of the project shop drawings.
- .3 Glass and glazing work under this section to conform to the IGMA North American Glazing Guidelines for Sealed Insulating Glass Units for Commercial & Residential Use.
- .4 Submit detailed attestation letter from manufacturer identifying each applicable NAFS-11 material, finish, and component requirement, and what measures the manufacturer has taken to comply with each requirement. Identify all non-compliant issues for Departmental Representative's review.
- .5 Sealed insulating unit manufacturer to be a member in good standing of IGMA and be prepared to submit evidence of current membership to the Departmental Representative on demand.
- .6 Window/door manufacturer to be a member in good standing of the Fenestration Association of British Columbia, and have a minimum of five years uninterrupted experience in successfully carrying out projects of similar size. Document describing past experience to be provided on request.
- .7 Laboratory test reports to be prepared by qualified independent testing laboratories.
- .8 Engage a Registered Professional Engineer licensed to practice in the province of British Columbia to:
  - .1 Design the window/door system, including glass and glazing, to meet the specified structural performance criteria or, at a minimum, the requirements of the NBCC.
  - .2 Supervise the preparation of shop and erection drawings.
  - .3 Field review the fabrication and installation of the products to ensure they comply with those drawings and the specified structural performance criteria.
  - .4 The cost of the above engineering and field review to be included as part of the cost for work under this section.
- .9 Construct and install windows/door mock-up as selected by Departmental Representative for field-testing. Ensure that all modifications required to pass field test are performed on all other affected or similar windows. Mock-up may form part of the completed construction.

#### 1.8 DELIVERY, STORAGE AND HANDLING

- .1 Keep handling to a minimum. Do not move the materials except as needed for installation.
- .2 Windows/door with broken flanges will be rejected by the Departmental Representative and must be replaced by the Contractor at the Contractor's expense.
- .3 Store materials inside when possible, in a clean well-drained area free of dust and corrosive fumes. Keep water away from stored assemblies.
- .4 Stack frames vertically on edge so that water cannot accumulate on or within materials. Use wood, cork, or plastic shims between components to provide for water drainage and air circulation.
- .5 If interior storage cannot be provided, cover materials with tarpaulins or plastic hung on frames so as to provide air circulation and prevent contaminants from contacting window/door framing, metal cladding or glass.

#### 1.9 PROTECTION

- .1 All trades to take all precautions necessary to protect materials, before and after installation, from lime, mortar, water run-off from concrete or copper, careless handling of tools, weld spatter, acids, roofing tar, solvents, abrasive cleaners and other items that could damage the glass surfaces and finishes. Trades are not to rely on protective plastic films to protect materials.

#### 1.10 SITE CONDITIONS

- .1 Do not install any windows/doors until all nearby welding, grinding, sandblasting, waterproofing, mortar work and acid etching are complete.
- .2 Report to the Departmental Representative in writing any defects in existing work, or unsatisfactory site conditions. Start no work until conditions are satisfactory. Start of work shall imply acceptance of existing conditions and surfaces.
- .3 Glaze with compounds, sealants, or tapes only when glazing surfaces are at temperatures recommended by the tape or sealant manufacturer.

#### 1.11 SCHEDULING / COORDINATION

- .1 Schedule activities such as welding, sandblasting, and grinding of steel or concrete, mortar work, acid etching and any other work harmful to finishes or glass, to be completed before start of window installation.

When such activities must be carried out in the vicinity of stored or installed windows provide hoarding or protection recommended by glazing manufacturer.

- .2 Co-ordinate the installation of anchors and structural connections with the appropriate Sections.
- .3 Co-ordinate the installation of air barriers with Section 07 27 13 – Modified Bituminous Sheet Air Barriers.
- .4 Co-ordinate work with related trades to ensure rough openings, structural supports, curbing and flashing are installed correctly to complement the work of this section.

#### 1.12 WARRANTIES

- .1 Provide window manufacturer's warranty stating that all windows will be free from defects in material and workmanship, and continue to perform satisfactorily for a period of five (5) years from the date of Substantial Performance of the Work.
  - .1 Satisfactory performance means compliance with the performance criteria and the testing and construction standards of this specification, and with the reviewed shop drawings. This includes the performance of finishes, hardware, glass and glazing materials, structural attachment, sealants and flashings.
  - .2 Correct all deficiencies that appear during the warranty period, including removal and replacement of failed sealed insulating units, at no costs to the Owner.
- .2 Provide manufacturer's standard warranty stating that the sealed insulating units will be free from material defects obstructing vision for a period of ten (10) years from the date of substantial performance.
- .3 Contractor to obtain, on behalf of the owner, copies of standard product warranties from the respective manufacturers and installers.

#### 1.13 FIELD DEMONSTRATION OF INSTALLATION PROCEDURES

- .1 The Departmental Representative will identify a location for a Field Demonstration of the window/door installation procedure.
- .2 The window/door manufacturer is to be present during the Field Demonstration
- .3 The window/door installation will be tested by the Owner for water penetration.
- .4 The window/door manufacturer will review the field demonstration and confirm in writing within 3 days that the warranty remains intact and has not been voided by improper installation methods or procedures.

## 2 PRODUCTS

### 2.1 MATERIALS AND COMPONENTS

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- .1 All materials, components and fasteners to meet the minimum tolerance, quality and testing requirements of NAFS-11 and the Canadian Supplement CSA A440S1-09. Where this specification duplicates requirements in these referenced standards, the more stringent of the two shall apply.
- .2 All materials used internally or externally to be corrosion resistant, non-staining, non-bleeding, and compatible with adjoining materials.
  - .1 All internal reinforcing steel shall be galvanized or shall have other corrosion resistance suitable to the Departmental Representative.
- .2 Hardware
  - .1 All components of corrosion resistant material compatible with adjacent materials.
- .3 Anchors and fasteners
  - .1 Exposed fasteners and anchors: stainless steel, or nickel-plated brass.
  - .2 Concealed fasteners or anchors where a portion of the fastener or anchor is exposed to the exterior wall cavity or an internal drainage cavity within the window that is designed to drain to the exterior: stainless steel, or nickel-plated brass.
  - .3 Concealed anchors interior of the moisture barrier may also be of carbon steel, painted after fabrication with zinc chromate or other primers not containing lead.
- .4 Sealants
  - .1 Sealants within framing system: as recommended by framing manufacturer
  - .2 Sealants between window and door frames and adjacent construction: provide joint sealants, primers and packing materials that comply with the requirements of Section 07 92 00 – Joint Sealants.
- .5 Glazing materials
  - .1 Interior gaskets and tapes: manufacturer's standard, as used in assemblies tested to meet performance criteria for air infiltration and water penetration.
  - .2 Glass setting blocks and edge blocks: neoprene, EPDM or silicones with an 80-90+/-shore durometer hardness. Block material to be compatible with sealed unit edge sealant. Setting blocks for sealed units with silicone edge seals must be silicone.

## 2.2 SEALED INSULATED GLASS UNITS

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- .1 Glass thickness and heat strengthening: to be determined according to CAN/CGSB-12.20-M89.
- .2 Dual sealed insulating glass units to have edge seals certified to CAN/CGSB-12.8 and be certified for argon gas retention.
- .3 Coatings: All insulated glass units to have a soft coat metallic low-e coating on the number 2 glass surface.
- .4 Gas fill: All insulating glass units to have a minimum 90% argon gas fill.
- .5 Edge Seal: twin primary seals of polyisobutylene; tubular aluminium spacer-bar frame with sealed corners, and filled with desiccant; secondary seal outside of spacer bar, bonded to both sheets of glass and bar, of silicone.
- .6 Glass thickness and heat treatment as required to meet code requirements. Minimum thickness is 3mm (1/8").

## 2.3 SYSTEM DESCRIPTION

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- .1 Window and doors shall be fabricated from extruded, impact resistant, rigid unplasticized polyvinyl chloride (uPVC). Windows to come complete with flange.
- .2 Frame, sash and door member shall be of hollow multi-chambered design with a wall thickness of approximately 2.7mm.
- .3 Reinforcing Steel: Cold rolled galvanized steel profiles designed to fit within each extruded uPVC window profile, and structurally fastened to the profile to ensure composite structural action.
- .4 Window framing shall incorporate a drained and vented system with complete air and vapour seal, allowing any water entering the framing to drain to the exterior and also allow air into the pressuring chamber. Vents and drain holes (orifices) shall be inconspicuously located and in such positions as not to contribute to staining, streaking or marking of the glass, or mullions.
- .5 Operating Hardware:
  - .1 Tilt and turn inward operation.
  - .2 Roto multi-point locking, RotoSil-nano coating on zinc/nickel alloy steel components operated with tilt and turn two-way pivoting hardware.
  - .3 White lever handle interior
- .6 Bug screens
  - .1 Operable window to have screens.
  - .2 Provide insect screens with extruded aluminum framing and fiberglass mesh to operable windows.



- .3 Bug screens to be secured to the window frame in locations which do not compromise the window integrity for water and air penetration. Screens to be easily removable by owner.
- .7 Provide continuity of building enclosure vapour and air barrier using glass and glazing materials utilising the inner light of multiple light sealed units for continuity of air and vapour seal.
- .8 Doors:
  - .1 Front Door – Pre-finished aluminum door with glazing c/w hardware
    - .1 As indicated on drawings. Reference Window & Door Schedule BE3.1.
    - .2 Powder coat finish.
    - .3 Reference Section 05 73 00.
  - .2 Back Door – Thermally broken galvanized painted hollow metal door, frame, and hardware
    - .1 As indicated on drawings. Reference Window & Door Schedule BE3.1.
    - .2 Painted finish in accordance with Section 09 90 00.
  - .3 Storage Room – Sliding wooden barn door c/w galvanized hardware
    - .1 As indicated on drawings.

## 2.4 FABRICATION

- .1 Window Frames
  - .1 Assemble windows to ensure neat, weather-tight construction
  - .2 Fabricate units square & true with a max tolerance of +/- 3mm for units with a diagonal measurement under 1800 mm, and +/- 6 mm for units with a diagonal measurement over 180 mm.
  - .3 Mechanical fasteners, welded components, flashings, and hardware must not bridge thermal barriers unless units tested for thermal performance or condensation resistance had the same thermal bridges.
  - .4 Conceal fasteners whenever possible
  - .5 All welding flashing to be removed from frame joints.
  - .6 Frame and sash corner joints fusion welded for strength and air/water tightness of joints. Frame mullion joints mechanically joined.
  - .7 Glass Stops: To be pressure fitted co-extruded type with flexible polymer fins. Removable from interior only. Exterior glazing beads not accepted.
- .2 Glazing
  - .1 Cut glazing tape to length and set against permanent stops, below sight line. Seal corners by butting tape and dabbing with sealant.
  - .2 Place setting blocks at 1/4 points, with edge block maximum 150 mm from corners.

- .3 Rest glazing on setting blocks and push against tape with sufficient pressure to attain full contact at perimeter of light or glass unit.

## 2.5 FINISHES

- .1 Unfinished vinyl framed windows:
  - .1 Standard exposed PVC material both interior and exterior.
  - .2 Colour: Standard White. Reference colour schedule.
  - .3 All exposed surfaces to be free of visible defects and scratches.
- .2 Prefinished vinyl framed window operable vent units:
  - .1 Pre-finished heat foil laminate custom colour both interior and exterior.
  - .2 Colour: Custom Red. Reference colour schedule.
  - .3 All exposed surfaces to be free of visible defects and scratches.
- .3 Products with applied finishes:
  - .1 Pigmented organic coating on PVC: AAMA 613 or AAMA 614
  - .2 Pigmented organic coating on fiber-reinforced thermoset profiles: AAMA 623 or AAMA 624
  - .3 Pigmented organic coating on wood or cellulosic composites: WDMA T.M. 12. Primer coatings on wood or cellulosic composites: WDMA T.M. 11.
  - .4 Pigmented organic coating on aluminum: AAMA 2604 or AAMA 2604.
  - .5 Anodized aluminum profiles or sheets: AAMA 611.

## **3 EXECUTION**

### 3.1 INSPECTION

- .1 Verify that openings are dimensionally within allowable tolerances, in accordance with reviewed shop drawings, plumb, level, clean, and provide a solid anchoring surface.
- .2 Take site dimensions before shop drawings or fabrication. Ensure fabricated work will fit openings and that allowance is made for deflection of structure and that required clearances to other work will be maintained.
- .3 Ensure all flashings built in or provided by others will integrate with the work of this section to divert all moisture to the exterior.
- .4 Do not begin to install windows until all conditions are satisfactory

### 3.2 SEALED GLAZING UNITS

- .1 Manufacture, handle and install sealed units in accordance with Insulating Glass Manufacturers Association (IGMA) guidelines.

### 3.3 INSTALLATION OF WINDOW UNITS

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- .1 Install membrane along windowsill and 150mm up each window jamb. Wrap membrane a minimum of 100mm into window opening. Refer to drawing details.
- .2 Install windows in accordance with CSA-A440.4.
- .3 Comply with reviewed shop drawings and manufacturers written instructions and recommendations.
- .4 Secure work to allow for anticipated movements of the building structure and thermal movements within the window framing system, without failure of sealants or compromising performance of the window system.
- .5 Conceal all fasteners except where unavoidable for structural anchorage or application of hardware.
- .6 Install continuous sealant application between exterior window flanges at head and jamb locations as shown on drawings.
- .7 Co-ordinate attachment and seal of perimeter air barrier materials with Section 07 27 13 - Modified Bituminous Sheet Air Barriers. Ensure building air barrier is effectively sealed to window framing.
- .8 Set sill flashings in full bead of caulking, dammed at ends and level in their length, with minimum 6% slope to exterior. Sill flashings that allow water to pond against framing or caulking will not be accepted.
- .9 Install glass and glazing materials as scheduled on the reviewed shop drawings and to the requirements of this specification.
- .10 Caulk joints between window framing and surrounding materials in accordance with the requirements of Section 07 92 00 – Joint Sealants.
- .11 Follow sealant manufacturer's recommendations for proper joint design, including use of joint fillers, primers, and bond breakers, as required to suit jobsite conditions. Ensure all surfaces to be sealed are clean and free of dust and construction debris.

### 3.4 ERECTION TOLERANCES

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- .1 Provide specified tolerances in surrounding work; ensure clearances marked on reviewed shop drawings are maintained. Erect window framing to the following tolerances:
  - .1 Maximum variation from plan or location shown on reviewed shop drawings to be 3 mm in 3000 mm of length or 13 mm in any total length.
  - .2 Maximum offset from true alignment between two identical members abutting end to end in line to be 1.6 mm.
  - .3 Square: maximum difference in length of diagonals to be 3 mm
  - .4 Corner offset: maximum offset from true alignment at glazing pocket corner joints to be 0.8 mm

- .5 Below: 1.6 mm in 1200 mm of length.

### 3.5 FIELD QUALITY CONTROL

- .1 On-site tests for water infiltration will be conducted with window manufacturer's representative present. Owner's representative will select units to be tested.
  - .1 Test the installed water penetration resistance of the products, to ASTM E 1105 Procedure B at the water penetration resistance test pressure specified in section 1.3.2.2.
  - .2 Test window including perimeter joint and interface with adjacent building construction.
  - .3 There shall be no water penetration as defined by Clause 5.4 of A440S1-09. Water droplets that are retained within the system due to surface tension do not constitute a failure provided they are not retarding drainage or ventilation of the cavity.
  - .4 Correct deficiencies in units that fail to meet specified requirements, and all units having similar deficiencies. Defective units to be retested.
- .2 The Owner will pay the cost for the original test. Costs for all retests, and for all repair work to defective units, to be paid by the responsible contractor.
- .3 Testing agency to be selected by the Owner.

### 3.5 PROTECTION

- .1 Contractor to protect installed work from damage caused by grinding and polishing compounds, plaster, cement, lime, acid or other contaminants, and the work or activities of other trades.
- .2 Install protective cover to frames and glazing where there is a high risk of damage. Use heavy Kraft paper or non-staining, non-hardening plastic films.
- .3 Consult with product manufacturer and installer to determine appropriate protective measures.

### 3.6 ADJUSTMENT

- .1 Adjust operating vents, doors, and hardware to operate smoothly and fit tightly when closed and locked, and be properly aligned with frames and with each other.

### 3.7 CLEANING

- .1 Remove all protective materials from frames and glazing. Remove all labels, and deposits which affect appearance or operation
- .2 Glass
  - .1 Clean glass surfaces according to instructions provided by glass fabricator or window/door manufacturer.
  - .2 Glass cleaning solutions to conform to CAN/CGSB-2.55

- .3 Do not use vigorous cleaning methods. Avoid scratching glass or finish of framing material. Contractor to be responsible for damages resulting from the use of inappropriate cleaning methods.

END OF SECTION



## **1 GENERAL**

### 1.1 DESCRIPTION

- .1 The work in this section includes but is not limited to:
  - .1 Interior drywall repairs.
  - .2 Ceiling finishes.
  - .3 Installation of interior finishes and trims.

### 1.2 REFERENCES

- .1 Association of Wall and Ceiling Contractors of British Columbia Manual
- .2 ASTM C36-68: Gypsum Wallboard
- .3 CSA A82.27 Gypsum Wallboard
- .4 CSA A82.31 Gypsum Wallboard Application
- .5 Millwork Standards of the Architectural Woodwork Manufacturers Association of Canada (AWMAC)
- .6 CSA B111 Wire Nails, Spikes and Staples
- .7 CAN/CSA-G164 Hot Dipped Galvanizing of Irregularly Shaped Articles.

### 1.3 QUALIFICATIONS

- .1 Interior finishes shall be completed by competent tradesmen, experienced and qualified in the work that is required.

### 1.4 SAMPLES

- .1 Provide for approval, prior to installation, samples of materials to be used for the interior finish repair and wood trim installation in accordance with Section 01 33 00 – Submittal Procedures.
- .2 Submit samples as required by Departmental Representative

### 1.5 MOCK-UP

- .1 Undertake mock-ups of typical interior finish work including window and door trim, sill and drywall repair as shown.

## **2 PRODUCTS**

### 2.1 MATERIALS

- .1 Gypsum Wallboard
  - .1 Standard Gypsum Wallboard to conform to Section 9.6 – Part 2, Item 1.1, AWCC Specification Manual, thickness and type to match existing.
- .2 Gypsum Wallboard Accessories:

- .1 Metal Corner beads: minimum 0.40 mm (28 ga) Z 180 zinc coated sheet steel to ASTM 525.
  - .2 Metal Casing Beads: minimum 0.45 mm (28 ga) Z180 zinc coated sheet steel to ASTM 525; "L" type or "J" type as required; beading angle or casing with one side knurled for joint filling.
  - .3 PVC Corner and Casing Beads: Rigid white PVC conforming to ASTM-D-3678 with perforated PVC flanges 44 mm wide as applicable.
  - .4 Paper Faced Metal Corner and Casing Beads: Sheet metal laminated to exposed paper tape; with metal flanges 19 mm to 32 mm wide as applicable.
  - .5 Vinyl mouldings: vinyl mouldings for joint treatment of vinyl faced gypsum wallboard
  - .6 Aluminium mouldings: Extruded aluminium mouldings with clear anodized finish, meeting AAMA specifications.
- .3 Gypsum Wallboard Joint Treatment:
- .1 Joint filler compound: dry-set mortar to conform to ANSI A-1181.1 or latex modified mortar to conform to ANSI A-118.4
  - .2 Joint tape: 50 mm wide coated fibre glass tape
  - .3 Water: Fresh, clean, potable, free from deleterious matter of alkalis
- .4 Interior Wood Window and Door Trim and Sill:
- .1 Use primed softwood lumber as shown with a moisture content 15% or less in accordance with the National Hardwood Lumber Association (NHLA), January 1982.
  - .2 Trim profiles as shown, samples required for approval by the Departmental Representative prior to work proceeding.
- .5 Wood blocking:
- .1 Solid wood blocking, in accordance with Section 06 10 00 - Rough Carpentry. Size wood blocking as needed to locate the wood stool flush with the metal sill angle.
- .6 Mechanical Fasteners by substrate:
- .1 Wood: Nails and staples to CSA B111, for interior areas. Wood screws to CSA B35.4. Stainless steel, type and size to suite application.
  - .2 Steel: Self-drilling and self-tapping screws with corrosion-resistant finish meeting minimum of 1,000 hours salt spray per ASTM B117 standards with 0% red rust.
  - .3 Gypsum Wallboard: to ASTM C646, self-drilling, self-threading case hardened screws with Phillips type head to provide minimum stud penetration of 15.9 mm.
  - .4 Terra-cotta Block or hollow masonry: Injectable hollow wall anchor fastening system.
  - .5 Concrete: Screws or impact anchors.
  - .6 Existing Lath: Corrosion resistant tie wire.



### **3 EXECUTION**

#### **3.1 EXISTING CONDITIONS**

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- .1 Gypsum wallboard and joint treatment shall not be applied to surfaces that are damp or contain frost. Ensure framing components plumb and true, dry and sound. Report in writing, any discrepancies to the Departmental Representative.

#### **3.2 PREPARATION**

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- .1 Carefully remove and store in a safe location until reinstatement all millwork, furniture, curtains, curtain runners, runner supports, radiator covers, and all other materials requiring removal to facilitate repair of drywall and installation of wood trim and millwork.
- .2 Provide suitable protection for window and door frames and other interior finishes which do not receive a drywall finish.

#### **3.3 GYPSUM WALLBOARD REPAIRS**

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- .1 As required, repair all damaged drywall so that it is ready for top coat paint application. All patches to be done to match the existing wall finishes to be unnoticeable after painting. Quality of patching will be reviewed by the Departmental Representative for acceptance.
- .2 Attach casing beads, if required, against windows and doors to allow drywall to finish flush. See drawings for requirements.
- .3 Attach corner beads to all exterior corners requiring repairs. Ensure that beads are applied securely.
- .4 All casing beads, corners and stops must be applied plumb and square.
- .5 Plan the gypsum wallboard installation to avoid butt-end joints if possible to reduce the amount of joint finishing.
- .6 Keep vertical joints at least 300 mm from the jamb lines of doors, windows and other openings.
- .7 Prepare existing drywall damaged areas by neatly cutting out drywall which is not securely attached or is fractured. Do not save small areas of drywall if one slightly larger patching piece will cover then entire plane of the wall. Cut infill drywall sheets so that the patched areas fit together neatly with the butt edges of boards in moderate contact; do not force into place. Remove ragged edges or burrs with rasp or sandpaper from existing and new wallboard edges.
- .8 Gypsum wallboard shall be cut by scoring and breaking, or by sawing, working from the face side. Cutouts for pipes, fixtures, or other small openings shall be scored in outline on both sides before knocking out, or shall be cut with a saw.
- .9 Fastener Application:

- .1 Screws shall be driven with a power screw-gun and set with countersunk head slightly below the surface of the gypsum wallboard. The paper face of the gypsum wallboard shall not be broken by the screw.
- .2 Perimeter screw spacing to be not less than 9 mm nor more than 12 mm from edges and ends
- .3 Screw spacing for other locations to be at 300 mm o.c.
- .10 Provide additional backing or blocking where necessary to permit proper attachment and patching of wallboard. Edges or ends of boards parallel to framing shall be continuously supported.
- .11 Mix joint compounds according to manufactures recommendations.
- .12 All joints between adjoining wallboard panels to be filled solid with jointing compound and then taped with alkali-resistant fibreglass tape.
- .13 Allow joint compounds to dry minimum of 24 hours, sand, apply 2<sup>nd</sup> coat and immediately double back to fill out to a smooth, dense surface, free of blemishes and irregularities. Edges butting against existing finishes to be filled and lightly feathered to conceal joint.
- .14 All plaster repairs to match existing work in texture and finish including ceilings. Apply base and finish coats to match the thickness of the existing plaster. Finish all plaster repairs flush and smooth with existing.
- .15 Prime paint all patched areas with suitable latex primer.

#### 3.4 INTERIOR TRIM MOULDINGS AND SILL FINISHES

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- .1 Install new primed interior wood window and door trim and sills as shown.
- .2 Do finish carpentry to Millwork Standards of the Architectural Woodwork Manufacturers Association of Canada (AWMAC) 1984, except where specified otherwise.
- .3 Scribe and cut as required to fit abutting walls and surfaces, to fit properly into recesses and to accommodate piping, columns, fixtures, outlets, or other projecting, intersecting or penetrating objects.
- .4 Form joints to conceal shrinkage.
- .5 Position items of finished carpentry work accurately, level, plumb, true and fasten or anchor securely.
- .6 Design and select fasteners to suit size and nature of components being joined. Use proprietary devices as recommended by manufacturer.
- .7 Set finishing nails to receive filler. Where screws are used to secure members, countersink screw in round cleanly cut hole and plug with wood plug to match material being secured.

- .8 Replace items of finish carpentry that are damaged in any way, or show signs of hammer impact or other bruises caused by the replacement of the window units or reinstallation of sliding balcony and swing doors.
- .9 Apply paintable latex sealant in accordance with Section 07900 at interface between wood trim, window /door frame and interior finishes. Sealant is to hide fasteners and angle used to secure windows and doors.

### 3.5 REINSTATEMENT

- .1 Unless otherwise indicated, repair and re-install to match the original condition all millwork, radiator grills and covers, furniture, curtains, curtain rods and all other materials damaged or removed to accommodate the replacement of the patio doors, or interior finishes.

### 3.6 CLEAN UP

- .1 Clean all dirt, debris, excess material etc. as a result of rehabilitation work.
- .2 Notify the Departmental Representative immediately following completion of all interior work and cleaning within a room or other area of the building.

END OF SECTION



## 1 GENERAL

### 1.1 DESCRIPTION

- .1 The work of this section includes the supply and installation of lathing and metal furring to support the exterior insulation and metal cladding assembly.
- .2 Includes all metal panel or accessories for exterior metal panel application including but not limited to the following:
  - .1 Z-girts c/w insulation retaining clip.
  - .2 Hat track channels.
  - .3 Special U or C Channels
  - .4 Double angles as shown
  - .5 Double (back to back) angle furring.
- .3 Includes fiberglass spacers and accessories.

### 1.2 REFERENCES

- .1 National Building Code of Canada
- .2 Association of Wall and Ceiling Contractors Specification Manual (latest edition)
- .3 British Columbia Wall and Ceiling Association Stucco Resource Guide (latest edition)
- .4 CSA CAN3-S136 Cold Form Steel Structural Members
- .5 ASTM C1063, Installation of Lath and Furring for Portland Cement Plaster
- .6 ASTM A653, Standard Specification for Steel Sheet, Zinc Coated (Galvanised) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot Dip Process
- .7 ASTM A123, Standard Specification for Zinc (Hot Dip Galvanised) Coatings on Iron and Steel Products
- .8 ASTM C833-96a Standard Specification for Welded Wire Lath
- .9 Canadian Sheet Steel Building Institute CSSBI 50M, Lightweight Steel Framing Manual.
- .10 Canadian Sheet Steel Building Institute CSSBI 51M, Lightweight Steel Framing Design Manual.

### 1.3 QUALITY ASSURANCE - STANDARD SPECIFICATIONS

- .1 Section 9.1 - Lathing and Metal Furring of Assurance - Standard the Association of Wall and Ceiling Contractors (A.W.C.C.) Specification

Standards Manual, together with authorized additions and amendments, shall be used as a reference standard when applicable and shall form part of this project specification.

- .2 Where modifications to the A.W.C.C. Specification Standards Manual are included in this project specification and results in a conflict, then the more stringent shall apply unless indicated otherwise by the Departmental Representative.

#### 1.4 COOPERATION WITH OTHER TRADES

- .1 Co-operate with other trades to allow for proper sequence of installation and properly accommodate diffusers, grilles, light fixtures, outlet boxes, access doors and other penetrations in furred surfaces.
- .2 Layout of the furring and cement board support is to be coordinated with the masonry trade. Mockups of the completed thin brick assembly are required prior to installing the remainder of the furring.

#### 1.5 PRODUCT DELIVERY / STORAGE / HANDLING

- .1 Deliver and store material undamaged in original wrappings or containers, with manufacturer's labels and seals intact.
- .2 Handle and store materials to prevent damage, inclusion of foreign matter, and rusting of metals.
- .3 Corner beads, casing beads, reveals and such trim shall be shipped in rigid packages to avoid damage. Bent or deformed materials will be rejected by the Departmental Representative.

#### 1.6 MOCK-UP

- .1 A mock-up is required at a location selected by the Departmental Representative. The Mock-up shall be completed and accepted prior to cement board sheathing work proceeding. The mock-up shall include self-adhesive membrane, flashing, insulation, insulation retaining clips, furring, fiberglass spacers, fasteners, z-girts, custom sub flashing for window returns and corners. The mock-up may remain as part of the finished work once approved by Departmental Representative.
- .2 The completed mockup for the thin brick assembly must include all components including pre-approved furring layout, cement board sheathing and masonry.

#### 1.7 JOB CONDITIONS

- .1 Examine the underlying surfaces and adjoining work and report visible defects at time of installation that might impair the lathing work to the Contractor in writing.
- .2 Commencement of work shall imply acceptance of surfaces to receive lath and metal furring.

- .3 Do not commence lathing or metal furring work until the work that is to receive it and site conditions is satisfactory.

### 1.8 SUBMITTALS

- .1 Submit certified copies of mill reports covering chemical and mechanical properties and all coating designation of steel used.

## **2 PRODUCTS**

### 2.1 ACCESSORIES

- .1 All metal accessories manufactured of stainless steel or minimum AZ50 (or AZM150) galvalume steel. Minimum thickness of material is 24 gauge unless noted otherwise. All accessories to be of the same material for the project unless otherwise approved by the Departmental Representative.
- .2 Sheet metal thicknesses without coating thicknesses are defined as:
  - .1 25ga is 0.0188" (0.478mm)
  - .2 20ga is 0.0346" (0.879mm)
  - .3 18ga is 0.0451" (1.146mm)
  - .4 16ga is 0.0566" (1.438mm)
  - .5 In no case is the supplied sheet steel to be less than 95% of the required thickness not including any coatings.

### 2.2 FASTENERS

- .1 Corrosion Protection:
  - .1 ITW Buildex Climacoat.
  - .2 Ruspert #3
  - .3 Leyland Industries DT2000
  - .4 Alternate screws will be reviewed if samples submitted with mechanical information and corrosion protection test data for comparison with published test data on corrosion performance of Climacoat Corrosion protection coating.
- .2 Z-girt, hat section, C or U furring channels and double angle furring to steel substrate:
  - .1 Self drilling, pancake head with wide quadrex head screws. Corrosion resistance capable of salt spray testing per ASTM B117 providing 2000 hours red rust and 30 cycles Kesternich SO<sub>2</sub>.
- .3 Z-girt, hat section, C or U furring channels and double angle furring at concrete substrates:
  - .1 Hex-head screws complete with washers. Concrete substrate requires predrilling for screw placement (1-1/2" min. embedment).

### 2.3 FURRING

- .1 Material Description:

- .1 For metal furring, base steel to CAN/CSA-S136, fabricated from ASTM A446M, Grade A to D steel. Steel to be identified as to specification, types, grade and mechanical properties.
- .2 Corrosion protection for base metal to be:
  - .1 Aluminium-zinc coated (Galvalume) steel sheet conforming to the requirements of ASTM A792M with a minimum coating of AZM150.
- .3 Hat Track Furring Channels
  - .1 Rolled formed, 20 ga (min). channel shaped "hat section". Size: 4" x 3/4" (100mm x 19mm) min or as indicated in drawings. Depth of section may vary to suit cavity wall requirements. Refer to drawings for specific gauge and size.
- .4 Z-Girt Furring
  - .1 Rolled formed, 0.048" (18 ga) (min) Z-Girt section.
- .5 Miscellaneous Furring
  - .1 1-1/2" x 1-1/2" (38 mm x 38 mm) (minimum size) double (back to back) angles – 18 gauge (min) as detailed on drawings to allow for adjustment of varying substrate conditions.
  - .2 Miscellaneous C or U and corner channel support to be 18 gauge (min).
  - .3 Inside and outside corner angles to be 20 gauge (min) to suit stud and girt positions.
- .6 Insulation clip:
  - .1 Corrosion protection shall be AZM150 or better to ASTM A653 or plastic to provide adequate support.
- .7 Isolation Coatings
  - .1 Bituminous paint or approved tape.

#### 2.4 FIBERGLASS SPACERS

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- .1 Sub framing Thermal Spacer: 100% Pultruded glass fibre and thermoset polyester resin insulation clip.
  - .1 Thermal Spacer thickness for top, base and web: 3/16" (4.8 mm) nominal.
  - .2 Thermal spacer length is 4" (76mm) nominal.
  - .3 Thermal spacer depth: Varies refer to the wall assembly details.
    - .1 Depth tolerance:  $\pm 0.127$  mm.
  - .4 Spacer Fasteners: High hex head washer head with sharp twin lead threaded design of heat treated corrosion resistant coated steel length to suit spacer depth and substrate.
    - .1 Fastener for steel framing: Hex head 1/4 - 14 x length to suit self-drilling screws. Minimum penetration into steel framing is 1/2" (13mm).
      - .1 Corrosion resistance capable of salt spray testing per ASTM B117 providing 2000 hours red rust and 30 cycles Kesternich SO<sub>2</sub>.



- .2 Fastener for wood framing: Hex head 1/4 - 10 x length to suit screws. Minimum of 1-1/2" (38mm) penetration into solid wood.
  - .1 Corrosion resistance capable of salt spray testing per ASTM B117 providing 2000 hours red rust and 30 cycles Kesternich SO<sub>2</sub>.
- .3 Fastener for cast-in-place concrete and concrete masonry units: Hex head 1/4 - 15 x length to suit concrete screw.
  - .1 Corrosion resistance capable of salt spray testing per ASTM B117 providing 2000 hours red rust and 30 cycles Kesternich SO<sub>2</sub>.
  - .2 Embedment depth: 1-1/2" (38 mm), except when into hollow concrete masonry unit in which case embedment is not less than 1" (25 mm).
- .4 Gasket Sealant for spacer flange to wall membrane contact.
  - .1 Neutral cure silicone as per Section 07 92 00 – Joint Sealants.

### 3 EXECUTION

#### 3.1 INSTALLATION - FURRING

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- .1 Erect vertical Z – girt, hat track and double angle furring members:
  - .1 Vertically to the face of air-barrier membrane at the face of the exterior wall in alignment for attachment with exterior steel studs at maximum 400 mm o/c in accordance with the drawings as shown.
  - .2 Shim and adjust furring and furring angles to achieve true, plumb and flush with adjacent surfaces. Double angles may be preferable to allow adjustability to ensure that completed construction is aligned true and plumb.
- .2 Erect double (back to back) angles:
  - .1 Vertically as shown to support drainage cavity stucco assemblies.
  - .2 Angles to be installed and adjusted in alignment to provide and maintain a true and plumb plane for attachment of metal or stucco cladding assemblies.
- .3 Erect miscellaneous furring angle supports to the face of the air-barrier membrane or concrete as required.
- .4 Fasten Z-girt, hat track furring and miscellaneous furring angle support members at intervals not exceeding 12" (300 mm) along support.
- .5 Isolation Coating: At locations where galvanized furring (Z-girt, hat track furring or miscellaneous furring angle) are installed in direct contact with concrete, apply a coating of bituminous paint between the furring member and the substrate.

### 3.2 INSTALLATION OF FIBERGLASS SPACERS

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- .1 Sub-framing Thermal Spacer Installation: Install thermal spacers in accordance with spacer manufacturer's written recommendations unless noted otherwise in this section. In case of conflict the more stringent of requirements will apply.
- .2 Thermal Spacer Installation spacing: Unless noted otherwise the maximum spacing for the spacers is 27" (660 mm) maximum on centre vertically and 16" (400 mm) maximum on centre horizontally. Refer to detail drawings for exact spacer layout.
- .3 Each spacer is to have a gasket sealant placed around each screw penetration at the wall membrane surface. Apply sealant to spacer flange before installing spacer on wall.
- .4 Ensure thermal spacer type is selected to accommodate orientation of vertical and horizontal sub-framing.
- .5 Concrete/masonry substrate:
  - .1 Pre-drill concrete or concrete masonry unit substrate to ½" (13 mm) deeper than anticipated embedment depth of fastener into substrate.
  - .2 Use drill diameter approximately 1/16" (1.6 mm) less than screw diameter in accordance with fastener manufacturer's written recommendations.
- .6 Steel or wood stud substrates:
  - .1 Ensure screws into steel studs are set by proper torque setting and not overdriven which will strip the steel stud hole.
- .7 Installation sequence for spacers, sub-framing, and insulation can be done by several different methods. All methods must achieve a uniformly spaced girt layout that is securely connected to the substrate with complete insulation coverage over the entire wall.
- .8 Girts and hat tracks can be pre-punched off site for ease of screw installation.
- .9 Attach the girts to the spacers and install each girt on the wall surface aligned vertically (or horizontally for horizontal girt system) and to suit the insulation width and the substrate type. Observe the stud spacing. Note girts can be installed sequentially with the insulation or all of the girts can be installed at once followed by the installation of the insulation.
- .10 Installation of the insulation is to include a notch cut edge of insulation board around each spacer to allow insulation to fully encase the web of the spacer. Notch the edge of the board that is away from the fiberglass flange which is at the outer edge of the spacer. This will secure the insulation in place without need for insulation clips, otherwise use sufficient number of stick pins or retention devices to ensure insulation remains flat and in correct position. Ensure insulation is tightly fitted at all sides. Alternate methods of insulation installation are possible but all methods must

achieve uniform coverage and tight fit against the substrate. Refer to the clip manufacturer for alternate methods of installation.

- .11 Insulation edges are not to be permanently deformed or damaged.

### 3.3 INSULATION FURRING STRIPS

- .1 At stucco rainscreen walls, provide 2" wide strips of mineral fiber insulation in vertical strips halfway between steel girts for breather board support. Secure insulation strips with temporary metal fastener. Insulation strips to be the same depth as the drainage cavity.

### 3.4 ADJUST AND CLEAN

- .1 Ensure all components are assembled in a manner to achieve clean, straight, true, plumb and flush finished stucco lines. Adjust as required.
- .2 Clean up rubbish due to lathing and metal furring operations daily and keep site in clean and acceptable condition at all times.

**END OF SECTION**



## 1 GENERAL

### 1.1 DESCRIPTION

- .1 The work described in this section includes interior and exterior paint application.

### 1.2 REFERENCES

- .1 Master Painters and Decorators Association of B.C. Reference Manuals (Painting Specification Manual):
  - .1 New Surfaces - CPCA/MPDA Painting Specification Manual, latest edition
  - .2 Existing Surfaces - MPDA Maintenance Repainting Guide, latest edition

### 1.3 REQUIREMENTS INCLUDED

- .1 This section of work shall include all labour, materials, tools, scaffolds and other equipment services and supervision required to cover with paint the surfaces of the building or structure, the building services and accessories not otherwise protected or covered, as shown on the "Colour Schedule", to the full intent of the drawings and specifications.
- .2 All finished areas that are affected by the work (new and existing) are to be fully prepared and painted in accordance with this specification in colours to match existing.
- .3 All surfaces to receive painting are to be fully finished, suitable for the application of pre-treatments, surface preparation, priming and coating in accordance with the Painting Specification Manual

### 1.4 QUALITY CONTROL

- .1 Retain purchase orders, invoices and other documents to prove that material used in contract meets requirements of specification and produce when requested by Departmental Representative.

### 1.5 QUALITY ASSURANCE

- .1 Conform to MPI's Painting Architectural Specification Manual and the Maintenance Repainting Manual, latest editions.
- .2 Qualification of the Manufacturer: The paint products of the Paint Manufacturer shall be listed in the Painting Specification Manual under "Paint Product Recommendation" section, or approved equivalent.
- .3 Qualification of Applicators: The contractor shall have a minimum of five (5) years proven satisfactory experience. This contractor shall maintain a qualified crew of painters throughout the duration of the work who shall be qualified to fully satisfy the requirements of this specification.

#### 1.6 SAMPLES AND MOCK-UPS

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- .1 Provide samples in accordance with Section 01 33 00 – Submittal Procedures.
- .2 When requested by the Departmental Representative, prepare and repaint designated surface, area or room to workmanship standards of the MPI Repainting Manual for review and approval. When approved, surface, area, room and/or items shall become acceptable standard of finish quality for similar on-site repainting work.
- .3 Apply coating test area to an agreed mock-up location to confirm method of application, material compatibility, adherence, bond, texture, finish and colour for each paint colour and type. Test area to be a minimum of 1 square metre.

#### 1.7 SUBMITTALS

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- .1 Provide submittals in accordance with Section 01 33 00 – Submittal Procedures.
- .2 Submit list of all painting materials to the Departmental Representative for review prior to ordering materials
- .3 When requested, submit invoice list of all paint materials ordered for project work indicating manufacturer, types and quantities for verification and compliance with specification and design requirements.
- .4 At project completion, provide an itemized list complete with manufacturer, paint type and colour coding for all colours used for Owner's later use in maintenance.

#### 1.8 DELIVERY AND STORAGE

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- .1 Deliver and store materials in manufacturer's original container, sealed with labels intact.
- .2 Ensure dry delivery and storage of materials and equipment at site.
- .3 Indicate on containers or wrappings:
  - .1 Manufacturer's name and address.
  - .2 Type of paint.
  - .3 Compliance with applicable standard.
  - .4 Colour number in accordance with established colour schedule.
- .4 Store materials and equipment in a well ventilated place with temperature range 10 to 30° C.

#### 1.9 ENVIRONMENTAL REQUIREMENTS

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- .1 Safety: comply with requirements of Workplace Hazardous Materials Information System (WHMIS) regarding use, handling storage, and disposal of hazardous materials.

- .2 Apply paint finishes only when temperature and ventilation at location of installation can be satisfactorily maintained within manufacturer's recommendations.
- .3 Substrate, ambient temperature and humidity must be within limits prescribed by manufacturer.
- .4 Provide temporary heating where permanent facilities are not available to maintain minimum recommended temperatures.
- .5 Apply paint finish only in areas where dust is no longer being generated by related construction operations such that airborne particles will not affect the quality of the finished surface.
- .6 Apply paint only when surface to be painted is dry, properly cured and adequately prepared.
- .7 Maximum moisture content of substrates as follows:
  - .1 Plaster and Wallboard – 12%
  - .2 Wood – 15%
  - .3 Concrete – 12%

#### 1.10 EXISTING CONDITIONS

- .1 Investigate structural problems related to safe execution of preparation of structure to be painted and report unsatisfactory conditions to Departmental Representative before beginning work.
- .2 Report to Departmental Representative conditions of deteriorated materials found during preparation, not previously disclosed.
- .3 The exposed concrete elements of the building have some delaminated coatings and must be identified at the start of the work to ensure repairs are made well in advance of painting.

#### 1.11 PROTECTION

- .1 Protect paint and painting equipment before use and during length of contract from climatic elements.
- .2 Protect structure from markings and other damage. Protect completed work from paint droppings. Use non-staining coverings.
- .3 Remove all electrical plates, surface hardware, fittings and fastenings, prior to painting operations. These items shall be carefully stored, cleaned and replaced on completion of work in each area. No solvent shall be used to clean hardware that will affect the finish of the hardware.
- .4 Provide for protection of passing pedestrians and the general public.

#### 1.12 SCHEDULING OF WORK

- .1 Submit work schedule starting and final completion dates for approval by Departmental Representative.

- .2 Take measures necessary to complete work within approved scheduled time. Change in schedule must be approved by Departmental Representative.
- .3 Co-ordinate execution with other work at site.

#### 1.13 ALTERNATIVES

- .1 Products conforming to this specification must be identified in writing by contractor for approval by Departmental Representative.
- .2 Changing manufacturers' brands, sources of supply of painting materials from those previously approved must be approved by Departmental Representative.
- .3 Request for alternative approval must be submitted in writing and be accompanied by full literature and recommendations from manufacturers concerned.

#### 1.14 MAINTENANCE MATERIALS

- .1 At project completion, provide 4 litres (1 gallon) of each type and colour of paint from same production run (batch mix) used in unopened cans, properly labelled and identified for Owner's last use in maintenance. Store where directed.

## **2 PRODUCTS**

### 2.1 MATERIALS

- .1 All materials (primers, paints, coatings, varnishes, stains, lacquers, fillers, thinners, solvents, etc.) shall be in accordance with the MPI Manuals "Approved Product" listing and shall be from a single manufacturer for each system used.
- .2 Other paint materials such as linseed oil, shellac, turpentine, etc. shall be the highest quality product of an approved manufacturer listed in the MPI Manuals and shall be compatible with other coating materials as required.
- .3 All materials and paint shall be lead and mercury free and shall have low VC or cure free of blemishes or sags.
- .4 Where required, paints and coatings shall meet flame spread and smoke developed ratings designated by local Code requirements and/or authorities having jurisdiction.

### 2.2 TOOLS AND EQUIPMENT

- .1 Painting equipment to best trade standards for type of product and application.
- .2 Departmental Representative will determine areas where power tools or equipment may be used for both preparing and painting of substrate.



### 2.3 MIXING AND TINTING

- .1 Unless otherwise specified, paints shall be ready-mixed. Re-mix prior to application to ensure colour and gloss
- .2 Paste, powder or catalysed paint mixes shall be mixed in strict accordance with manufacturer's written instructions
- .3 Perform all colour tinting operations prior to delivery of paint to site.
- .4 Where thinner is used, addition shall not exceed paint manufacturer's recommendations
- .5 Confirm with manufacturer that the addition of tinting components will not significantly affect performance characteristics

### 2.4 GLOSS / SHEEN

- .1 Paint gloss shall be defined as the sheen rating of applied paint, in accordance with the following values:
  - .1 Flat or matte – 0 – 5 units at 60 degrees to a maximum of 10 units at 85 degrees.
  - .2 Eggshell, velvet or low lustre – 5 – 25 units at 60 degrees to a minimum of 10 units at 85 degrees
  - .3 Satin – 20 – 35 units at 60 degrees
  - .4 Semi-gloss – 35 – 65 units at 60 degrees
  - .5 Gloss – 65 units or greater.
- .2 Finish (i.e. gloss level) of all painted surfaces shall be as indicated by Departmental Representative.

### 2.5 PAINTING AND FINISH SCHEDULE

- .1 Exterior Wood (Including but not limited to: Trim, Joists, Soffits, Wood Barn Door, Cedar Board):
  - .1 EXT 6.3A, Premium Grade, Semi Gloss, pre-primed on all surfaces.
  - .2 Top coat and primer to include a fungicide.
- .2 Interior Wood (Including but not limited to: Trim, Existing Joists and Cedar Board):
  - .1 INT 6.3U, Premium Grade, (Semi Gloss Finish), pre-primed on all surfaces. Allow for pre-priming off-site for all new materials.
- .3 Sheet Metal Ducts (interior only):
  - .1 INT 5.3J, Premium Grade, (Semi Gloss Finish).
- .4 Custom Fabricated Hollow Steel Sections (including but not limited to: Pipe Columns):
  - .1 EXT 5.1H, Premium Grade, Gloss Level G6. Paint all welds. Pre-prime all surfaces.

- .5 Galvanized Metal (including but not limited to: Handrails, Metal Doors and Frames):
  - .1 EXT 5.3D, etch primer / 2 component aliphatic polyurethane (Gloss Finish).
- .6 Custom Flashing Assemblies: EXT 5.3D, etch primer / 2 component aliphatic polyurethane coating (Gloss Finish) applied according to manufacturer's recommendations.
  - .1 All custom flashing to be shop painted by approved applicator.

### 3 EXECUTION

#### 3.1 CONDITION OF SURFACES

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- .1 Prior to commencement of work of this section, thoroughly examine all conditions and surfaces scheduled to be repainted and report in writing to the Departmental Representative any conditions or surfaces that will adversely affect work of this section.
- .2 No repainting or painting work to commence until all such adverse conditions and defects have been corrected and surfaces and conditions are acceptable to the Departmental Representative.

#### 3.2 SURFACE PREPARATION

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- .1 Prepare all surfaces in accordance with the requirements of MPI Manuals.
- .2 Protect all adjacent surfaces and areas from painting operations and damage by drop cloths, shields, masking, templates, or other suitable protective means and make good any damage caused by failure to provide such protection
- .3 Remove and securely store all miscellaneous hardware and surface fittings and fastenings including but not limited to electrical plates, mechanical louvers, light fixtures and trim, mouldings, etc. prior to repainting and replace upon completion. Carefully clean and replace all such items upon completion of repainting work in each area. Do not use solvent or reactive cleaning agents on items that will mar or remove finishes.
- .4 Sand, clean dry etch, neutralize and/or test all surfaces under adequate illumination, ventilation and temperature requirements.
- .5 Wood, plywood and millwork: All wood surfaces shall be clean and dry with moisture content readings of less than 15%. Remove all foreign matter prior to prime coat applications. Knots, pitch streaks and sappy sections shall be spot coated with sealer. Fill all nail holes and fine cracks after primer had dried and sand between prime and following coats except final coat. Back prime interior and exterior woodwork and all cut ends.
- .6 Drywall: Surfaces shall be in a ready condition to paint. Remove contamination, prime surface to show defects. Any imperfections showing after application of the prime coat shall be corrected by

- drywall contractor. After defects have been remedied, proceed with paint coatings.
- .7 Mildew Removal: Scrub with a solution of T.S.P. and bleach, rinse with clear water and allow surface to dry completely.
  - .8 Metal Flashing with Inorganic Zinc Rich Primer: Prepare as directed by applicator of zinc rich primer.
  - .9 Custom Metal Fabrications and Metal Doors/Frames:
    - .1 Prepare as directed in Section 5.3 – Surface Preparation, MPI Architectural Painting Specification Manual.
    - .2 Ensure all soldering residue has been cleaned from the surface of the metal and neutralized.
  - .10 Metal Doors and Frames:
    - .1 Prepare as directed in Section 5.3 – Surface Preparation, MPI Architectural Painting Specification Manual.
  - .11 Concrete surfaces:
    - .1 Prepare as directed in Section 3.1 – Surface Preparation, MPI Architectural Painting Specification Manual.
    - .2 Include power washing to clean off surface dirt.

### 3.3 PAINT APPLICATION

- .1 Do not paint unless substrates are acceptable and/or until all environmental conditions (heating, ventilation, lighting, weather conditions and precipitation, or completion of other work) are acceptable for application of products.
- .2 Cold weather painting, when temperatures are less than 10 degrees C, is only permitted when paints formulated for lower temperatures are used and manufacturer's limitations are observed for maximum humidity levels and minimum temperatures. Contractor to submit technical information regarding paint manufacturer's recommendations for cold weather work and protection.
- .3 Paint and repaint all surfaces requiring paint, stain or coating to minimum MPI Manual finish requirements with application methods in accordance with best trade practices for type and application of materials used.
- .4 Painting coats specified are intended to cover surfaces satisfactorily when applied at proper consistency and in accordance with manufacturer's recommendation
- .5 Method of application and uniform coats of specified film thickness be in agreement with paint supplier and Departmental Representative.
- .6 Apply each coat at the proper consistency.
- .7 Sand lightly and dust between coats to achieve an anchor for the next coat and to remove defects visible from a distance up to 1000 mm.

- .8 Do not apply finishes on surfaces that are not sufficiently dry. Unless manufacturer's directions state otherwise, each coat shall be sufficiently dry and hard before a following coat is applied.
- .9 Interior woodwork which is to receive a paint or enamel finish shall be back-primed upon arrival at the job site with enamel undercoating paint
- .10 All interior surfaces requiring repairs as a result of exterior wall rehabilitation shall be sanded, primed and repaired to a paint ready finish only.
- .11 Custom flashing fabrications
  - .1 Site preparation and painting will not be acceptable.
- .12 Exterior Wood
  - .1 Exterior wood that is to receive a paint finish shall be back-primed upon arrival at the job site with exterior primer paint.
  - .2 All exposed and concealed cut edges shall be primed and painted prior to installation.

#### 3.4 FIELD QUALITY CONTROL

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- .1 Painted, repainted and primed surfaces shall be considered to lack uniformity and soundness if any of the following defects are apparent:
  - .1 Runs, sags, hiding or shadowing by inefficient application methods
  - .2 Evidence of poor coverage at rivet heads, plate edges, lap joints, crevices, pockets, corners and re-entrant angles
  - .3 Damage due to touching before paint is sufficiently dry or any other contributory cause
  - .4 Damage due to application on moist surfaces are caused by inadequate protection for the weather
  - .5 Damage and/or contamination of paint due to window blown or air born contaminants
  - .6 Evidence of poor paint bonding.
  - .7 Painted, repainted or primed surfaces rejected by the Departmental Representative shall be made good at the expense of the Contractor
- .2 Examine surface for adequate preparation.
- .3 Check all materials for correctness.

#### 3.5 CLEAN-UP

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- .1 Removal of all paint where spilled, splashed, splattered or sprayed as work progresses using means and materials that are not detrimental to affected surfaces.
- .2 Keep work area free from an unnecessary accumulation of tools, equipment, surplus materials and debris

- .3 Remove combustible rubbish material and empty paint cans each day and safely dispose of same in accordance with requirements of authorities having jurisdiction.
- .4 Clean equipment and dispose of wash water / solvents as well as all other cleaning and protective materials, paints, thinners, paint removers/strippers, in accordance with the safety requirements of authorities having jurisdiction.
- .5 Protect area where paint has been applied and avoid scuffing newly applied paint.

END OF SECTION



## **1 GENERAL**

### **1.01 WORK INCLUDED**

- .1 This Section of the Specification forms part of the Contract Documents and is to be read, interpreted and coordinated with all other parts.
- .2 The General Conditions, Supplements, Amendments and Mechanical General Requirements 23 05 00 shall govern the plumbing sections (i.e. 22 17 00) of the work (read in conjunction with the Instructions to Tenderers or Bidders). This section covers items common to the 22 00 00 series sections and is intended only to supplement the requirements of Division 1.

### **1.07 SEISMIC RESTRAINT**

- .1 Provide restraint on all piping, ductwork, equipment and machinery, which is part of the building mechanical service systems to prevent injury or hazard to persons and equipment and to retain equipment in its normal position in the event of an earthquake. This specification covers equipment, which is not specifically covered in SMACNA.
- .2 Provide all seismic restraint related hardware, (including bolts and anchors) from point of attachment to equipment through to and including attachment to structure.
- .3 When equipment is mounted on concrete housekeeping pads, and / or concrete curbs the anchor bolts shall extend through the pad into the structure.
- .4 It is the entire responsibility of equipment manufacturers to design their equipment so that the strength and anchorage of internal components of the equipment exceeds the force level used to restrain and anchor the unit itself to the supporting structure.
- .5 Seismic restraints may only be omitted where permitted by SMACNA.

### **1.08 FIRESTOPPING**

- .1 Provide firestopping where piping, ducts, or wiring passes partially or full through the fire separations (mechanical room), in accordance with the BC Building Code or Codes Canada, whichever is the more stringent.

**END OF SECTION**





## **GENERAL**

### **1.01 RELATED WORK**

- .1 This Section of the Specification forms part of the Contract Documents and is to be read, interpreted and coordinated with all other parts.

### **1.02 SCOPE OF WORK**

- .1 Connect to the utility company's gas meter set, or to the supplier's site mounted storage tank.
- .2 Provide all gas piping, fittings, valves, pressure regulators, unions, hangers and supports, and all other components as required for a complete installation generally as depicted on the drawings.
- .3 Distribute gas to all gas outlets, appliances and equipment that require gas service.
- .4 Submit to the Provincial Gas Inspection Department documentation and detailed drawings as required, pay for and obtain a permit and approval for the gas installation prior to commencing work.
- .5 All materials and installations shall comply with CAN/CSA B149.1 Natural Gas and Propane Installation Code, and B.C. Code Amendments.

### **1.3 PAINTING AND COLOR CODING**

- .1 Painting of all gas piping, equipment and material installed under this Division of the specification shall be included under this Division of the work.
- .2 Paint all exterior piping including the section of piping from the gas meter or tank to the building entry, and all exterior pressure regulating valve vent piping.
- .3 Painting shall consist of one coat of Rust-Oleum 769 damp proof red primer, one coat of Rust-Oleum 960 zinc chromate and two finish coats of Rust-Oleum 850 grey enamel paint.
- .4 Provide yellow color coding identification banding of the gas piping as required by the gas code.

## **2 PRODUCTS**

### **2.01 BELOW GROUND PIPING**

- .1 No gas piping shall be installed below the building.

### **2.02 ABOVE GROUND PIPING**

- .1 Schedule 40 seamless carbon steel to ASTM A53 and CSA B-63.

### **2.03 FITTINGS**

- .1 Screwed fittings up to 50 mm diameter shall be malleable iron with beaded ends, Class 150 to ANSI B16.3.
- .2 Welded fittings 65 mm and larger shall be forged steel of the same weight as the connecting pipe. Steel butt weld fittings to ANSI B16.9a. Steel pipe flanges and flanged fittings to ANSI B16.5.
- .3 Unions shall be malleable iron with ground joints to ANSI B16.3.
- .4 Thredolets or Weldolets: - Acceptable Products: Grinnell, Anvil, CCTF, Bonny Forge.
- .5 Provide dielectric fittings where a buried service enters and connects to the building piping.

#### **2.04 JOINT MATERIALS**

- .1 Screwed: Thread lubricant or teflon paste.
- .2 Teflon tape is unacceptable.
- .3 Flanged: Full faced gasket materials to ANSI B16.20, ANSI B16.21 or ANSI B21.11, flanged steel weld neck, raised face type, carbon steel (ASTM A307) square headed bolts with hexagon nuts to ANSI B18.2.1 and ANSI B18.2.2. Bolts shall be full diameter of bolt holes.

#### **2.05 MANUAL ISOLATION VALVES**

- .1 Provincial Gas Department approved and suitable for the temperature to which they are exposed.
- .2 Screwed end valves up to 50 mm and flanged end valves 65 mm and larger.
- .3 Acceptable Products: Red & White / Toyo 5044A, Kitz 58, Homestead 601, Emco, Mueller, Rockwell, DeZurik.

#### **2.06 PRESSURE REGULATING VALVES**

- .1 High tensile iron body with synthetic rubber diaphragm and valve disc.
- .2 CSA listed for use in gas piping systems.
- .3 Acceptable Products: Rockwell, Fischer.

### **3 EXECUTION**

#### **3.01 PIPE JOINTING**

- .1 Install all piping in accordance with CSA B149.1, Natural Gas and Propane Installation Code.
- .2 Cut pipe ends square utilizing proper pipe cutting tools. Ream pipe ends and clean scale and dirt from inside and outside the pipe before and after assembly.
- .3 Protect all openings in piping and equipment, by capping or plugging to prevent the entry of dirt or debris during construction.

- .4 Slope piping down in the direction of flow to low points and provide dirt legs with capped ends.
- .5 Interior gas piping - screw or weld up to 50 mm [2"]; weld 65 mm [2½"] and larger.
- .6 Interior gas piping located in unvented spaces, in supply or return air ceiling plenums, or operating at 35 kPa [5 psi] pressure or higher - weld all sizes.
- .7 Exterior gas piping - weld all sizes Use welding tees to make all branch connections, except those less than half the diameter of the main. Branch connections less than half the diameter of main may be made with weldolets or threadolets.
- .8 Use eccentric reducers at changes in pipe size, to provide for positive drainage.
- .9 Remake all leaking joints.
- .10 Do not paint dielectric isolating couplings.
- .11 Provide pressure regulators and lockable shut-off valves at the discharge of the gas meter before entry into the building.
- .12 Provide heat shrink factory extruded polyethylene sleeves over bare metallic pipe at welds.

### **3.02 CONNECTIONS TO EQUIPMENT, APPLIANCES AND SPECIALTY COMPONENTS**

- .1 Provide a manual isolation valve on each branch line to an individual piece of equipment, appliance and gas outlet or specialty component upstream of dirt legs, unions and flanges.
- .2 Install unions or flanges on connections to all pressure regulators, equipment, appliances and specialty components.
- .3 Arrange piping connections to allow ease of access and for removal of equipment.
- .4 Align and independently support piping connections to prevent piping stresses being transferred to equipment.

### **3.03 MANUAL ISOLATION VALVES**

- .1 Install gas manual isolation valves complete with handles at the following locations:
  - .1 At all locations shown on the drawings.
  - .2 At the service entry point to each building immediately prior to entry.
  - .3 Immediately upstream of all pressure regulating valves.
- .2 All building isolation valves shall possess locking lugs.

### **3.04 SEISMIC ACTUATED SHUT-OFF VALVES**

- .1 Install gas seismic actuated automatic shut-off valves at the service entry point to each building immediately prior to entry.

### **3.05 PRESSURE REGULATING VALVES**

- .1 Install pressure regulating valves in each equipment room or at each piece of equipment where the gas supply pressure exceeds low pressure ("W.C.).

- .2 Pipe the relief vent ports full diameter to atmosphere in accordance with the requirements of CSA B149.1, Natural Gas and Propane Installation Code.

### **3.06 VENT TERMINALS**

- .1 Terminate vent outlets to atmosphere at the following minimum lateral distances:
  - .1 1.5 metres from any door, openable window or building opening including building mechanical exhaust openings and louvers.
  - .2 3.0 metres from any mechanical forced air intake.

**END OF SECTION**

**1.1 SECTION INCLUDES**

- .1 Pipe and pipe fittings.
- .2 Equipment: Water heaters, pumps.

**1.2 RELATED SECTIONS**

- .1 Section 23 05 00 - Mechanical Requirements.

**1.3 SUBMITTALS**

- .1 Section 01 33 10: Submission procedures.
- .2 Shop Drawings: Include product description, model, dimensions, component sizes, rough-in requirements, service sizes, finishes, connections to other equipment and piping, performance data, power requirements, and certified pump curves.
  - .1 Installation Data: Manufacturer's special installation requirements.
  - .2 Manufacturer's Certificate: Certify that specified Products meet or exceed specified requirements.

**1.4 CLOSEOUT SUBMITTALS**

- .1 Section 01 70 00: Submission procedures.
- .2 Operations and Maintenance Data:
  - .1 Include fixture trim exploded view and replacement parts lists.
  - .2 Include operation, maintenance, and inspection data, replacement part numbers and availability, and service depot location and telephone number.
- .3 Record Documentation: Accurately record actual locations of piping and floor drains.

**1.5 WARRANTY**

- .1 Warranty Period:
  - 1.1 Five (5) years all products unless otherwise noted.
  - 1.2 Heating Appliance Warranty - Combination domestic water heater and in-line circulator
    - 1) Package: Five Year Parts and Labour,
    - 2) Heat Exchangers: ten years.

**Part 2 Products**

**2.1 WATER PIPING, ABOVE GRADE**

- .1 Copper tubing type K hard drawn; with cast brass or wrought copper fittings; 95/5 solder joints.

## **2.2 FLANGES, UNIONS, AND COUPLINGS**

- .1 Pipe Size 50mm and Under: Malleable iron unions for ferrous piping; soldered bronze unions for copper pipe.
- .2 Dielectric Connections: Union with galvanized or plated steel threaded end, Copper solder end, water impervious isolation barrier.

## **2.3 BALL VALVES**

- .1 Valves Up to 50 mm: Bronze body, stainless steel ball, teflon seats and stuffing box ring, lever handle, solder or threaded ends with union.

## **2.4 GAS COCKS**

- .1 Cocks Up to 50 mm: Bronze body, bronze tapered plug, non-lubricated, teflon packing, threaded ends.

## **2.5 SWING CHECK VALVES**

- .1 Valves Up to 50mm: Bronze swing disc, solder or screwed ends.

## **2.6 WATER PRESSURE REDUCING VALVES**

- .1 Valves Up to 50mm: Bronze body, stainless steel and thermoplastic internal parts, fabric reinforced diaphragm, strainer, double union ends.

## **2.7 RELIEF VALVES**

- .1 Valves: Bronze body, teflon seat, steel stem and springs, automatic, direct pressure actuated, capacities ASME certified and labelled.

## **2.8 COMMERCIAL GAS FIRED COMBI WATER HEATER, CB-1**

- .1 Automatic, natural gas-fired, demand heating/domestic water unit with stainless steel dual primary and secondary heat exchangers suitable and approved for light commercial application.
- .2 Fully self-contained controls with separate domestic hot water and hydronic set-point and reset curves, set-back and all low water and safety cut-outs.
- .3 Integral heating circulation pump.
- .4 Suitable for coaxial sealed combustion venting.
- .5 Nominal efficiency: 94%.
- .6 Shall come complete with condensate neutralizer, outdoor reset sensor, coaxial venting assembly for vertical application (roof) and integrated pump controller.
- .7 Basis of Design/Standard of Acceptance: NTI Trinity Tx.
- .8 Capacity:
  - .1 Domestic water production: 0.32 l/s at 10C IncWT, 49C OWT (5.1 GPM at 50F incoming water temperature, 120F outlet water temperature)
  - .2 Heating capacity: 13kW (44.8 MBH) Heating at 0.23 l/s (3.5 USGPM); temp LWT 160 (71c) with 130 (54c) EWT ret water (condensing)

- .9 Acceptable Products: NTI, Navien NCB-E

**Part 3 Execution**

**3.1 INSTALLATION**

- .1 Install equipment in accordance with manufacturer's instructions.
- .2 Install piping to conserve building space and not interfere with use of space. Route piping in orderly manner and maintain gradient. Group whenever practical at common elevations.
- .3 Install piping to allow for expansion and contraction without stressing pipe, joints, or connected equipment. Provide clearance for installation of insulation and access to valves and fittings.
- .4 Slope water piping and arrange to drain at low points.
- .5 Install unions downstream of valves and at equipment or apparatus connections.
- .6 Provide non-conducting dielectric connections wherever jointing dissimilar metals. Install brass male adapters each side of valves in copper piped system. Sweat solder adapters to pipe.
- .7 Install ball valves for shut-off and to isolate equipment, part of systems, or vertical risers.
- .8 Install globe valves for throttling, bypass, or manual flow control services.
- .9 Install water hammer arrestors complete with accessible isolation valve.

**3.2 SERVICE CONNECTIONS**

- .1 Make connections to existing services in building.

**END OF SECTION**





**Part 1            General**

**1.1                SECTION INCLUDES**

- .1    Pipe and pipe fittings, valves, strainers,
- .2    Expansion tanks, air vents, air separators.
- .3    Valves, relief valves.
- .4    Circulators and pumps.

**1.2                RELATED SECTIONS**

- .1    Section 23 05 50 - Mechanical Insulation.

**1.3                SUBMITTALS**

- .1    Section 01 33 00: Submittal Procedures.
- .2    Product Data: Include manufacturer's data on pipe material pipe fittings, valves and accessories.
- .3    Shop Drawings:
  - .1    Include component sizes, rough-in requirements, service sizes, and finishes. Include produce description, model, dimensions, component sizes, rough-in requirements, service sizes, and finishes.
  - .2    Submit certified pump curves showing performance characteristics with pump and system operating point plotted. Include NPSH curve when applicable.
- .4    Manufacturer's Certificate: Certify that specified Products meet or exceed specified capacities.

**1.4                CLOSEOUT SUBMITTALS**

- .1    Section 01 78 00: Closeout Submittals.
- .2    Operations and Maintenance Data: Include installation instructions, assembly views, lubrication instructions, assembly views and replacement parts list.
- .3    Record Documentation: Accurately record actual locations of piping and pumps. Record changes in piping location and type.

**1.5                QUALITY ASSURANCE**

- .1    All works to comply with the requirements of Codes Canada 2015, or the BC Building Code 2012, whichever is more stringent.
- .2    Conform to ASME (Boiler and Pressure Vessels Code) BPVC-VIII - Rules for Construction of Pressure Vessels for manufacture of tanks.
- .3    Conform to ASME B31.9 - Building Services Piping.

**Part 2 Products**

**2.1 HEATING WATER PIPING**

- .1 Copper Tubing: Type L hard drawn, with cast brass or wrought copper fittings, 95/5 solder or silver braze.

**2.2 EQUIPMENT DRAINS AND OVERFLOWS**

- .1 Copper Tubing: Type M hard drawn, with cast brass or wrought copper fittings, 95/5 solder or silver braze.
- .2 PVC Pipe: Schedule 40 or SDR 21 or 26, with PVC fittings, solvent weld joints.

**2.3 FLANGES, UNIONS, AND COUPLINGS**

- .1 Pipe Size 50mm and Under: Malleable iron unions for threaded ferrous piping; bronze unions for copper pipe, soldered joints.
- .2 Grooved and Shouldered Pipe End Couplings: Malleable iron housing clamps, elastomer composition sealing gasket, galvanized for galvanized pipe.
- .3 Dielectric Connections: Union with galvanized or plated steel threaded end, copper solder end, water impervious isolation barrier.

**2.4 GLOBE VALVES**

- .1 Up to 50mm: Bronze body, bronze trim, rising stem and handwheel, inside screw, renewable composition disc, solder or screwed ends, with back seating capacity.

**2.5 BALL VALVES**

- .1 Up to 50mm: Bronze one piece body, stainless steel ball, teflon seats and stuffing box ring, lever handle, solder or threaded ends with union.

**2.6 PLUG COCKS**

- .1 Up to 50mm: Bronze body, bronze tapered plug, non-lubricated, teflon packing, threaded ends, with wrench operator.
- .2 Over 50mm: Cast iron body and plug, pressure lubricated, teflon packing, flanged ends, with wrench operator with set screw.

**2.7 SWING CHECK VALVES**

- .1 Up to 50mm: Bronze swing disc, solder or screwed ends.
- .2 Over 50mm: Iron body, bronze trim, swing disc, renewable disc and seat, flanged ends.

**2.8 SPRING LOADED CHECK VALVES**

- .1 Iron body, bronze trim, stainless steel spring renewable composition disc, screwed, wafer or flanged ends.

**2.9 RELIEF VALVES**

- .1 Bronze body, teflon seat, steel stem and springs, automatic, direct pressure actuated, capacities ASME certified and labelled.

**2.10 HYDRONIC HEATING COIL, HC-1**

- .1 Aluminium fins on copper tubing, and header(s) with galvanized metal frame, suitable for installation in sheet metal plenum.
- .2 Nominal size: 700 x 700 (28" x 28"), 14 fpi, 2 row-3 circ heating service.
- .3 Net Capacity: 13 kw at 0.23 l/s (44.3 mbh at 3.5 USGPM), at 70C (160 F) EWT, 15.5C (60 F) EAT, 54 C (130 F) LWT  
Nominal air flow: 755 l/s at 50 Pa APD (1600 cfm at 0.2" wg)
- .4 Acceptable Products: Heatcraft, Ventrol

**2.11 DIAPHRAGM - TYPE COMPRESSION EXPANSION TANKS**

- .1 Compression Tank: Welded steel with flexible EPDM diaphragm sealed into tank, and steel legs or saddles.
- .2 Accessories: Pressure gage and air-charging fittings, tank drain; pre-charge to
- .3 Size: to suit capacity of service.

**2.12 AIR VENTS**

- .1 Manual Air Vents: 3 mm brass needle valve.
- .2 Float Type: Brass or semi-steel body, copper float, stainless steel valve and valve seat, isolating valve.
- .3 Washer Type: Brass with hydroscopic fibre discs, vent ports, adjustable cap for manual shut-off, and integral spring loaded ball check valve.

**2.13 AIR SEPARATORS**

- .1 In-line Air Separators: Cast Iron for Sizes 40 mm and smaller, or steel for sizes 50mm and larger.

**2.14 STRAINERS**

- .1 Size 50mm and Under: Screwed Brass or iron body Y pattern with 0.8 mm stainless steel perforated screen.

**Part 3 Execution**

**3.1 INSTALLATION**

- .1 Install equipment in accordance with manufacturer's instructions.
- .2 Install piping to conserve building space and not interfere with use of space and other work. Route piping in orderly manner and maintain gradient. Group whenever practical at common elevations.

- .3 Install piping to allow for expansion and contraction without stressing pipe, joints, or connected equipment. Provide clearance for installation of insulation and access to valves and fittings.
- .4 Slope piping and arrange to drain at low points. Use eccentric reducers to maintain top of pipe level.
- .5 Provide valved drain and hose connection on strainer blow down connection.
- .6 For automatic air vents in ceiling spaces or other concealed locations, provide vent tubing to nearest drain.
- .7 Pipe relief valve outlet to nearest floor drain.
- .8 Perform tests determining strength of ethylene glycol and water solution and submit written test results.
- .9 Decrease from line size with long radius reducing elbows or reducers. Support piping adjacent to pump such that no weight is carried on pump casings.
- .10 Provide line sized shut-off valve and strainer on pump suction, and line sized check valve and balancing valve on pump discharge.

### **3.2 APPLICATION**

- .1 Use grooved mechanical couplings and fasteners only in accessible locations.
- .2 Install unions downstream of valves and at equipment or apparatus connections.
- .3 Install brass male adapters each side of valves in copper piped system. Solder adapters to pipe.
- .4 Install gate, ball or butterfly valves for shut-off and to isolate equipment, part of systems, or vertical risers.
- .5 Install globe, ball or butterfly valves for throttling, bypass, or manual flow control services.
- .6 Use plug cocks for throttling service. Use non-lubricated plug cocks only when shut-off or isolating valves are also provided.
- .7 Provide 20 mm(3/4 inch) drain valves at main shut-off valves, low points of piping, bases of vertical risers, and at equipment.
- .8 Provide manual air vents at system high points and as indicated.
- .9 Provide air separator on suction side of system circulating pump and connect to expansion tank.
- .10 Provide relief valves on pressure tanks, low pressure side of reducing valves, heat exchangers, and expansion tanks.

**END OF SECTION**

**Part 1        General**

**1.1        SECTION INCLUDES**

- .1        Materials and methods for mechanical work.

**1.2        RELATED SECTIONS**

- .1        Division 01 - General Requirements.

**1.3        INTENT**

- .1        Provide complete and fully operational mechanical systems with facilities and services to meet requirements described herein and in complete accord with applicable codes and ordinances.
- .2        Drawings are diagrammatic and approximately to scale unless detailed otherwise. They establish scope, material and quality and are not detailed installation instructions.
- .3        Connect to equipment furnished in other sections and by Owner, including uncrating equipment, installing, starting, and testing.

**1.4        CUTTING AND PATCHING - EXECUTION**

- .1        Locate holes and provide sleeves, cutting and fitting required for mechanical work. Relocate improperly located holes and sleeves.
- .2        Perform patching in finished construction of building under the sections of specifications covering these materials.

**1.5        SEISMIC RESTRAINT**

- .1        Provide restraint on all piping, ductwork, equipment and machinery, which is part of the building mechanical service systems to prevent injury or hazard to persons and equipment and to retain equipment in its normal position in the event of an earthquake. This specification covers equipment, which is not specifically covered in SMACNA.
- .2        Provide all seismic restraint related hardware, (including bolts and anchors) from point of attachment to equipment through to and including attachment to structure.
- .3        When equipment is mounted on concrete housekeeping pads, and / or concrete curbs the anchor bolts shall extend through the pad into the structure.
- .4        It is the entire responsibility of equipment manufacturers to design their equipment so that the strength and anchorage of internal components of the equipment exceeds the force level used to restrain and anchor the unit itself to the supporting structure.
- .5        Seismic restraints may only be omitted where permitted by SMACNA.

## **1.6 SHOP DRAWINGS AND PRODUCT DATA**

- .1 Section 01 33 00: Submittal Procedures.
- .2 Indicate manufacturer, trade name and model number. Include copies of applicable brochure or catalogue material. Indicate sizes, types, model numbers, ratings, capacities and options being proposed.
- .3 Include dimensional data for roughing in and installation, and technical data sufficient to confirm that equipment meets requirements of drawings and specifications.
- .4 Include wiring, piping and service connection data, motor sizes complete with voltage ratings and schedules.
- .5 Manufacturer's Certificate: Certify that specified Products meet or exceed specified requirements.

## **1.7 CLOSEOUT SUBMITTALS**

- .1 Section 01 78 00: Closeout Submittals.
- .2 Operations and Maintenance Data: Provide capacity extension type catalogue binders bound with heavy fabric, hot stamped lettering front and spine. Provide [two (2)] copies to Owner and one (1) copy to Consultant.
  - .1 Index binder to following system:
    - .1 Tab - 1.0 - Mechanical Systems: Title page with clear plastic protection cover.
    - .2 Tab - 1.1 - List of Mechanical Drawings.
    - .3 Tab - 1.2 - Description of Systems: Provide complete and detailed description of systems.
    - .4 Tab - 1.3 - Operating Division: Provide complete and detailed operation of major components.
    - .5 Tab - 1.4 - Maintenance and Lubrication Division: Provide preventative maintenance and lubrication schedule for major components.
    - .6 Tab - 1.5 - List of Equipment Suppliers and Contractors: Provide list of equipment suppliers and contractors, including address and telephone number.
    - .7 Tab - 2.1 - Certification: Include copy of test data on heating system, tests performed on piping systems, balancing data for air and water systems, valve tag identification and pipe colour code, inspection approval certificates for plumbing, heating, and ventilation systems and operational tests on gas-fired equipment.
    - .8 Tab - 3.1 - Shop Drawings and Maintenance Bulletins: Provide materials received in compliance with clause 'Shop Drawings', arrange alphabetically.
  - .2 Submit documents to Consultant for approval prior to being turned over to the Owner.
- .3 Record Drawings and Documentation:

- .1 Keep on site, an extra set of Drawings and specifications recording changes and deviations daily.
- .2 Accurately record actual locations and tags.

**1.8 ACCEPTABLE MATERIALS AND EQUIPMENT**

- .1 Contract: Based on materials and equipment specified.
- .2 Submit proposals to supply alternative materials or equipment in writing, to the Consultant, at least ten working days prior to closing date of bids for mechanical sections.
- .3 Equipment manufacturers listed in individual sections are approved alternatives for this project and are subject to requirements of drawings and specifications. Revisions required to adapt alternatives shall be the responsibility of the Contractor.

**1.9 EQUIPMENT PROTECTION AND CLEAN-UP**

- .1 Protect equipment and materials in storage on site, during and after installation until final acceptance. Leave factory covers in place and take special precautions to prevent entry of foreign material into working parts of piping and duct systems.
- .2 Protect equipment with polyethylene covers and crates.
- .3 Operate, drain and flush bearings and refill with change of lubricant before final acceptance.
- .4 Protect bearings and shafts during installation. Grease shafts and sheaves to prevent corrosion. Provide extended nipples for lubrication.
- .5 Ensure that existing equipment is carefully dismantled and not damaged or lost. Do not re-use existing materials and equipment unless specifically indicated.

**1.10 MATERIAL AND EQUIPMENT**

- .1 Material and Equipment: New and quality specified. Statically and dynamically balanced rotating equipment for minimum vibration and low operating noise level.

**1.11 MATERIAL IDENTIFICATION**

- .1 Identify piping, ductwork and equipment throughout with labels and direction of flow arrows. Apply labels at 15 m intervals, before and after pipes pass through walls, at access door openings or closer. Labels shall be black, 20 mm minimum letters on yellow backgrounds.
- .2 Identify electric starting switches and remote push-button stations with 6 mm laminated plastic plates.

**1.12 EQUIPMENT BASES AND SUPPORTS**

- .1 Construct supports of structural steel members or steel pipe and fittings. Brace and fasten with flanges bolted to structure.

**1.13 SLEEVES**

- .1 Set sleeves in position in advance of concrete work. Provide suitable reinforcing around sleeves.

- .2 Extend sleeves through potentially wet floors 25 mm (1.0 inch) above finished floor level. Caulk sleeves full depth and provide floor plate.
- .3 Where piping or ductwork passes through floor, ceiling or wall, close off space between pipe or duct and construction with non-combustible insulation. Provide tight fitting metal caps on both sides and caulk.
- .4 Install chrome plated escutcheons where piping passes through finished surfaces.
- .5 Size large enough to allow for movement due to expansion and to provide for continuous insulation.

**1.14 INSERTS**

- .1 Inserts: Malleable iron case of [galvanized] steel shell and expander plug for threaded connection with lateral adjustment, top slot for reinforcing rods, lugs for attaching to forms.
- .2 Size inserts to suit threaded hanger rods.

**1.15 FLEXIBLE PIPE CONNECTIONS**

- .1 Steel Piping: Stainless steel inner hose and braided exterior sleeve.
- .2 Copper Piping: Bronze inner hose and braided exterior sleeve.
- .3 Spool Pieces: Construct to exact size for insertion of flexible connection.

**1.16 FIRESTOPPING**

- .1 Provide firestopping where piping, ducts, or wiring passes partially or full through the fire separations (mechanical room), in accordance with the BC Building Code or National Building Code of Canada, whichever is the more stringent.

**END OF SECTION**



**Part 1 General**

**1.1 SECTION INCLUDES**

- .1 Materials and methods for mechanical work.

**1.2 RELATED SECTIONS**

- .1 Division 01 - General Requirements.

**1.3 General**

- 1.4 Apply insulation and accessories so that the finished product is smooth and neat and with longitudinal seams concealed from view. Apply insulation, accessories and finishes in accordance with the manufacturer's recommendations.

- 1.5 Insulation and vapour barrier shall be continuous through all non-rated separations.

- 1.6 Finish and seal insulation at hangers, supports, access doors fire dampers and other insulation protrusions.

**1.7 Ductwork**

- .1 External Insulation - Flexible. Maximum thermal conductivity: 0.040 W/m-°C at 24°C [0.27 Btu-in/(hr-ft<sup>2</sup>-°F) at 75°F].
  - .1 Scope: 25mm on outdoor air and exhaust ducts/plenum to/from HRV.
  - .2 Acceptable Manufacturers: Certaineed STP Ductwrap #75, Johns Manville Microlite FSK, Manson Alley-Wrap FSK, Owens Corning all service faced duct wrap, Knauf FSK Ductwrap.
- .2 Duct Liner - Flexible. Minimum noise reduction criteria (NRC): 0.70 as per ASTM C423 'Type A mounting'.
  - .1 Scope: 25mm on all ductwork where indicated by single hatching on drawings.
  - .2 Acceptable Manufacturers: Certaineed Ultralite #150, Johns Manville Linacoustic, Johns Manville Permacote, Knauf Duct Liner EM, Manson Akousti-Liner, Owens Corning Areomat Duct Liner.

**1.8 Piping Insulation**

- .1 Mineral Fibre - Low and Medium Temperature, vapour barrier jacket. Maximum thermal conductivity: 0.033 W/m-°C at 24°C [0.23 Btu-in/(hr-ft<sup>2</sup>-°F) at 75°F]:
  - .1 Scope:
    - .1 25mm on all heating water supply and return piping.
    - .2 13mm on all domestic water piping.
  - .2 Acceptable Products: Johns Manville Micro Lok Ap-T Plus, Manson Alley K, Owens Corning SSL-11, Partek Paroc 1200 ASJ/SSL.
- .2 Refrigerant piping:
  - .1 Flexible Foamed Elastomeric Insulation.

- .1 Acceptable Products: AP Armaflex, Rubatex R-180-FS.
- .2 Flexible Closed Cell Insulation.
  - .1 Acceptable Products: Bondtex Polyethylene, Therma-Cel.
- .3 Flexible elastomeric and flexible closed cell insulation adhesive:
  - .1 Acceptable Products: Armstrong 520, Therma-Cel 1590, Rubatex R-373, Zipcoat 8A.
- .4 Refrigerant Suction and Hot Gas: 25mm thick flexible foamed elastomeric or flexible closed cell preformed piping insulation. Secure longitudinal and butt joints with adhesive. Insulate all fittings and components. Finish with flexible elastomeric or flexible closed cell insulation coating.

**END OF SECTION**

**1.1 SECTION INCLUDES**

- .1 Washable and disposable panel filters.
- .2 Ductwork.
- .3 Dampers.
- .4 Air turning devices.
- .5 Flexible duct connections.
- .6 Terminal units, damper motor operators.
- .7 Diffusers, boots, registers, grilles.
- .8 Outside louvres, roof hoods, goosenecks.

**1.2 SUBMITTALS**

- .1 Section 01 33 00: Submittal Procedures.
- .2 Shop Drawings:
  - .1 Indicate filter media, filter performance data, filter assembly and filter frames.
  - .2 Indicate silencer size, air pressure drop, dynamic insertion loss and sound generation. Indicate configuration, general assembly, and materials used in fabrication.
  - .3 Indicate air terminal unit configuration, general assembly, and materials used in fabrication. Include catalog performance ratings which indicate air flow, static pressure, and NC designation. Include schedules listing discharge and radiated sound power level.
  - .4 Submit schedule of air outlets and inlets indicating outlet or inlet type, size, location, application, and noise level. Review requirements, check locations and make necessary adjustments in position to conform with architectural features, symmetry, and lighting arrangement.
- .3 Samples: Submit [two (2)] samples of replacement filter media of each type and filter frame.
- .4 Manufacturer's Certificate: Certify that Products meet or exceed [specified requirements].

**1.3 CLOSEOUT SUBMITTALS**

- .1 Section 01 78 00: Closeout Submittals.
- .2 Operation and Maintenance Data:
  - .1 Include manufacturer's descriptive literature, operating instructions, and maintenance and repair data, and parts lists.
  - .2 Include instructions for operating, changing, and periodic cleaning of filters.
  - .3 Include in operating instructions, directions for resetting constant volume regulators.

## **1.4 REGULATORY REQUIREMENTS**

- .1 Conform to SMACNA for construction of ductwork.

## **Part 2 Products**

### **2.1 FILTERS**

- .1 Disposable Panel Filters: 50 mm thick fibre blanket, factory sprayed with adhesive, nominal size 610 x 610 mm in cardboard frame with perforated metal retainer.
- .2 Filter Frames: 1.50 mm 16 ga galvanized steel or extruded aluminum T-section construction with necessary gasketing between frames and walls.

### **2.2 DUCTWORK**

- .1 Materials
  - .1 Steel Ducts: Galvanized steel sheet, lock-forming quality.
  - .2 Aluminum Ducts: Aluminum sheet, alloy 3003-H14.
  - .3 Sealant: Non-hardening, water resistant, fire resistive liquid used alone or with tape.
- .2 Ductwork
  - .1 Fabricate and support in accordance with SMACNA HVAC Duct Construction Standard - Metal and Flexible except as indicated. Provide duct material, gages, reinforcing, and sealing for operating pressures indicated. All round duct to be spiral seam.
  - .2 Construct T's, bends, and elbows with radius of not less than 1-1/2 times width of duct on centre line. Where not possible provide turning vanes.
  - .3 Divergence upstream of equipment shall not exceed 30 degrees; convergence downstream shall not exceed 45 degrees.
  - .4 Connect flexible ducts to metal ducts with draw bands plus sheet metal screws.
  - .5 Use crimp joints with or without bead for jointing round ducts sizes 200 mm and smaller with crimp in direction of air flow.

### **2.3 VOLUME CONTROL DAMPERS**

- .1 Fabricate in accordance with SMACNA HVAC Duct Construction Standards - Metal and Flexible.
- .2 Fabricate multi-blade damper of opposed blade pattern with maximum blade sizes 300 x 1825 mm. Assemble centre and edge crimped blades in prime coated or galvanized channel frame with suitable hardware.
- .3 Except in round ductwork 300 mm and smaller, provide end bearings, oil-impregnated nylon or sintered bronze.
- .4 Provide locking, indicating quadrant regulators on single and multi-blade dampers.

## **2.4 FIRE DAMPERS**

- .1 Fabricate to NFPA 90A, UL 555, CAN/ULC-S112 and CAN/ULC-S112.2 as indicated.
- .2 Fusible links, ULC-S505, shall separate at 71 degrees. Provide adjustable link straps for combination fire/balancing dampers.

## **2.5 BACK DRAFT DAMPERS**

- .1 Gravity back draft dampers, size 450 x 450 mm or smaller, furnished with air moving equipment, may be air moving equipment manufacturers standard construction.
- .2 Fabricate multi-blade, parallel action gravity balanced back draft dampers of galvanized steel or extruded aluminum, with centre pivoted blades with felt or flexible vinyl sealed edges, linked together with steel ball bearings and plated steel pivot pin.

## **2.6 AIR TURNING DEVICES**

- .1 Multi-blade device with blades aligned in short dimension, steel or aluminum construction, with individually adjusted blades, mounting straps.
- .2 Multi-blade device with radial blades attached to pivoting frame and bracket, steel or aluminum construction, with push-pull operator strap.

## **2.7 FLEXIBLE DUCT CONNECTIONS**

- .1 UL listed fire-retardant neoprene coated woven glass fibre fabric to NFPA 90A, approximately 75 mm wide, crimped into metal edging strip.

## **2.8 DUCT ACCESS DOORS**

- .1 Fabricate in accordance with SMACNA HVAC Duct Construction Standard Metal and Flexible.
- .2 Access doors smaller than 300 mm square may be secured with sash locks. Access doors with sheet metal screw fasteners are not acceptable.

## **2.9 AIR OUTLETS**

- .1 Registers/Grilles: Streamlined and individually adjustable curved blades to discharge air along face of grille, two-way deflection. Refer to schedule in section 3.2 below.
  - .1 Basis of Design: Titus, EH Price.

## **2.10 Fixed Louvres – Aluminum**

- .1 Material: extruded aluminum alloy [6063-T5].
- .2 Blades: 100 mm deep at 45° and 90 mm centres. Uprturned rain stop at trailing edge, drip channel at leading edge.
- .3 Frame, head, sill and jamb: 100 mm deep one piece extruded aluminum, minimum 12 ga. Channel type frame, no flange. Jamb drainage channel.
- .4 Mullions: at 5 ft maximum centres, continuous blade.

- .5 Fastenings: stainless steel (Society of Automotive Engineers) SAE-194-8F with SAE-194-SFB nuts and resilient neoprene washers between aluminum and head of bolt, or between nut, ss washer and aluminum body.
- .6 Screen: 12 mm 16 ga wire aluminum birdscreen on inside face of louvres in formed 20 ga aluminum U-frame, removable.
- .7 Finish: anodized. Colour: to Architect's approval.
- .8 Basis of Design: Airlite K6774
- .9 Acceptable Products: Westvent, Ruskin

**Part 3 Execution**

**3.1 INSTALLATION**

- .1 Install devices in accordance with manufacturer's instructions.
- .2 Provide balancing dampers at points on low pressure supply, return, and exhaust systems where branches are taken from larger ducts as required for air balancing.
- .3 Demonstrate re-setting of fire dampers to authorities having jurisdiction and Owner's representative.
- .4 Provide back draft dampers where indicated.
- .5 Provide flexible connections immediately adjacent to equipment in ducts associated with fans and motorized equipment.

**END OF SECTION**

## **1 GENERAL**

### **1.01 RELATED WORK**

- .1 This Section of the Specification forms part of the Contract Documents and is to be read, interpreted and coordinated with all other parts.

### **1.02 TESTS**

- .1 Give written 24-hour notice of date for tests.
- .2 Do not externally insulate or conceal work until tested and approved. Follow construction schedule and arrange for tests.
- .3 Bear costs including retesting and making good.
- .4 Refer to Piping Sections for specific test requirements.
- .5 Prior to tests, isolate all equipment or other parts which are not designed to withstand test pressures.

### **1.03 TESTING AND BALANCING**

- .1 Employ an approved independent testing and balancing agency to test and balance the following systems. Prior to finalizing contractual arrangements with the balancing agency, submit the names, qualifications and years of direct field testing and balancing experience in the testing and balancing field for all members of the balancing team that is scheduled to carry out the balancing work. The senior site technologist must have a minimum of five years testing and balancing experience of similar projects. Provide a list of a minimum of ten comparable projects successfully completed by all key members of the balancing team.
- .2 The Agency shall be responsible to the Contractor but report jointly to the Consultant and the Contractor. Report in writing to the Consultant any lack of cooperation and any discrepancies or items not installed in accordance with the contract documents.
- .3 Procedures shall be in general accordance with AABC'S National Standards for Field Measurement and Instrumentation and ASHRAE Standards.
- .4 The balancing agency shall agree to perform spot checks, where requested, in the presence of the Consultant's designated representative.
- .5 Work with the agency to:
  - .1 Ensure that all mechanical systems are complete and ready to be balanced and provide sufficient time for testing and balancing prior to substantial performance.
  - .2 Make corrections to achieve system balance without delay, include all corrections made during the balancing procedure on "As Built" Drawings. Mechanical Contractor to provide "As Built" information to the balancing agency before balancing commences.
  - .3 Adjust fan drives, change blade pitch angles and change sheaves and belts as directed by the agency.
  - .4 Maintain all systems in full operation during the complete testing and balancing

- period.
- .5 Employ the journeyman millwright to check the alignment of any V-belt drives and/or shaft coupling drives if they have been adjusted during the balancing process. Belt tension correctness to be verified.
  - .6 Consult with the Consultant to clarify the design intent where necessary or in case there are any problems foreseen as the balancing processes.
  - .7 Accuracy: Balance to maximum flow deviation of 10% at terminal device and to 5% at equipment. Measurements to be accurate to within plus or minus 5% of actual values.
  - .8 This agency shall remove and re-install ceiling tile to provide access to ductwork and piping. The balancing agency will make good any damage or soiling caused by his forces.
  - .9 Instrument calibration: At the Consultants request, the balancing agency shall submit a dated calibration chart for all instruments.
  - .10 Permanently mark final settings on valves, dampers and other adjustment devices. Set and lock all memory stop balancing devices.
  - .11 Seal all holes with snap plugs or approved alternate method, used for flow and pressure measurements.
  - .12 The controls contractor and balancing agency are to allow for checking and making adjustments during the 12-month warranty period, when weather conditions provide natural loads and in cases where complaints arise.
  - .13 Submit a draft balance report to the Consultant for approval and submit approved copies to the agency preparing the O & M manuals for inclusion in each operating and maintenance manual. Provide field notes in the balancing report to clearly identify unusual conditions, problem areas and report on any cases where the specified flow rates or conditions could not be achieved by adjustment. Identify outstanding problems that cannot be corrected by the balancing team or that will not be corrected by the installing trades (e.g. in cases where additional balancing dampers are required).
  - .14 Submit a statutory declaration to the Consultant, certifying that the testing and balancing procedures have been completed, that complete factual reports have been distributed and that directions have been given to the Contractor to correct faults and omissions and, finally, that follow-up testing, after correction of faults and omissions, has been completed and recorded. Reports to be signed by the senior member of the balancing team.

#### **1.04 AIR SYSTEMS - BALANCING**

- .1 Adjust duct and terminal balance dampers, and adjust or change drive sheaves and fan blade pitch angles to obtain design quantities (within +/-10%) at each outlet and inlet.
- .2 Use terminal balance dampers to regulate air quantities only to the extent that adjustments do not create objectionable air motion or sound levels. The sheet metal sub contractor shall provide additional dampers where required by the balancing agency to achieve a satisfactory balance without creating noise problems.



- .3 Make air quantity measurements in ducts by "Pitot Tube" traverse of entire cross-sectional area of duct. Provide a pitot tube traverse test sheet for each major duct branch.
- .4 Measure air quantities at each air terminal.
- .5 Maintain the design relationship between the supply and exhaust air system quantities.
- .6 Check to ensure that supply and return air quantities provide reasonable building pressurization. Test building pressurization levels in variable volume systems throughout full range of fan delivery rates, under both heating and cooling conditions. Exit doors and elevator shafts should be checked for air flow so that exterior conditions do not cause excessive or abnormal pressure conditions. Document abnormal building leakage conditions noted.
- .7 Air systems shall be balanced with clean filters in place, at a total of 105% to 110% of specified total airflow rates.
- .8 The Balancing Agency shall include for return visits for readjustment of systems after the owner has moved in.
- .9 Include in the air balance report:
  - .1 Date of test, Name and address of building and balancing technician's name.
  - .2 Range of outdoor air temperature during the balancing period.
  - .3 System schematics indicating damper positions, design and measured air quantities at each inlet and outlet. Show room numbers and floors.
  - .4 Record fan discharge traverse air volumes to establish system leakage.
  - .5 Main branch duct traverses. Maximum and minimum outdoor air quantities.
  - .6 Static pressure across each component in an air handling system at full flow.
  - .7 Face velocities across major components such as filter or coils.
  - .8 Static pressure across each fan.
  - .9 Fan and motor speed.
  - .10 Motor size, starting time, amps and voltage.
  - .11 Coil air entering and leaving temperatures (D.B. and W.B.).
  - .12 Maximum and minimum zone supply air temperatures under prevailing conditions at time of test.
  - .13 Provide fan performance curve for each new air handling system.

**END OF SECTION**



**Part 1 General**

**1.1 SECTION INCLUDES**

- .1 Packaged air handling units – heat recovery.

**1.2 RELATED SECTIONS**

- .1 Section 23 30 00 - Air Distribution.

**1.3 SUBMITTALS**

- .1 Section 01 33 00: Submittal Procedures.
- .2 Product Data: Indicate dimensions, weights, capacities, ratings, fan performance, motor electrical characteristics, gages and finishes of materials.
- .3 Shop Drawings:
  - .1 Indicate assembly, unit dimensions, weight loading, required clearances, construction details, and field connection details.
  - .2 Provide fan curves with specified operating point clearly plotted.
  - .3 Submit sound power levels for both fan outlet and casing radiation at rated capacity.
  - .4 Submit electrical requirements for power supply wiring including wire diagrams for interlock and control wiring, clearly indicating factory-installed and field-installed wiring.
- .4 Manufacturer's Certificate: Certify that Products meet or exceed specified requirements.

**1.4 CLOSEOUT SUBMITTALS**

- .1 Section 01 78 00: Closeout Submittals.
- .2 Operation and Maintenance Data: Include instructions for lubrication, filter replacement, motor and drive replacement, spare parts lists, and wiring diagrams.

**1.5 SOURCE QUALITY CONTROL**

- .1 Fans used shall not decrease motor size, increase noise level, increase tip speed by more than 10% or increase inlet air velocity by more than 20%, from specified criteria; and capable of accommodating static pressure variations of plus or minus 10%.

**Part 2 Products**

**2.1 PREFABRICATED HEAT RECOVERY AIR UNITS**

- .1 Prefabricated Air Unit: Unit with fan and coil section plus accessories, including heat recovery coil, factory fabricated and tested for size and capacity, and draw-thru configuration, suitable for low pressure operation, vertical (floor mount) inlet and discharge.

- .1 Casing: Galvanized steel on channel base or drain pan of welded steel coated externally with zinc chromate, iron oxide, phenolic resin paint.
  - .2 Insulation: 25 mm neoprene coated, glass fibre insulation, 0.037 W/m/degree K applied to internal surfaces with adhesive and weld pins.
  - .3 Finish: Zinc chromate, iron oxide, phenolic resin paint. Seal fixed joints with flexible weather tight sealer. Seal removable joints with closed-cell foam gasket. Provide cap strips over roof flanges. Provide rain caps and gaskets on access doors.
- .2 Filters:
    - .1 Flat arrangement with 25 mm deep washable permanent panel filters.
  - .3 Performance:
    - .1 113 l/s (239 CFM) at 110 Pa (0.45" WC) ESP
    - .2 Sensible heat recovery; minimum 66% at 0 deg C.
  - .4 Standard of Acceptance: Venmar AVS X30 HRV.

### **Part 3 Execution**

#### **3.1 INSTALLATION**

- .1 Install to manufacturer's written instructions.
- .2 Install flexible connections between fan inlet and discharge ductwork. Ensure metal bands of connectors are parallel with minimum 25 mm flex between ductwork and fan while running.
- .3 Pipe condensate drains to nearest floor drain.
- .4 Do not operate fans for any purpose until ductwork is clean, filters in place, bearings lubricated, and fan has been test run under observation.

**END OF SECTION**

### 1.01 RELATED WORK

- .1 This Section of the Specification forms part of the Contract Documents and is to be read, interpreted and coordinated with all other parts.

### 1.02 QUALITY ASSURANCE

- .1 Catalogued or published ratings shall be those obtained from tests carried out by manufacturer or those ordered by him from independent testing agency signifying adherence to codes and standards.

### 1.03 SUBMITTALS

- .1 Fan shop drawings shall include sound rating data and fan curves showing operating point plotted on curves.
- .2 Fan shop drawings shall include motor efficiencies.

### 1.04 GENERAL

- .1 Motors powered by variable speed drive controllers shall be EEMAC class B with Type F "inverter duty" insulation, shall have a 1.15 service factor on sine wave power, 1.0 service factor on PWM power and meet NEMA Code MG-1, 1993 Part 31.

## 2 PRODUCTS

### 2.01 AIR HANDLER and INDOOR COIL PACKAGE HPI

- .1 Minimum Requirements:
  1. Heavy gauge galvanized steel housing, lined with 18mm of acoustical insulation, arranged for ducted inlet and outlet connections.
  2. Forward curved centrifugal wheel of galvanized steel.
  3. Motor of permanently lubricated sleeve bearing type, mounted on vibration isolators, and compatible for use with speed controls
  4. Motor complete with thermal overload protection.
  5. Spring-loaded backdraft damper.
  6. Access panel.
  7. Electrical disconnect.
- .2 Description:
  1. Small commercial air handling unit for use with matching split system evaporator section, vertical upflow air direction
  2. Electrically commutated variable speed motor and direct drive FC fan
  3. 18mm acoustically lined cabinet
  4. Staggered rifled copper tubes mechanically expanded into aluminum fins
  5. Factory-installed horizontal drain pan.
  6. Nominal Capacity:  
Air Handler: 755 l/s at 115 Pa (1600 CFM at 0.65" WC) ESP  
Cooling capacity: 13 KW (44 mbh) at 29C DB/19C WB. Heating Capacity: 10 kw (33 mbh) at -3C.

7. Standard of Acceptance York N1VSC with G2FD048 matching cased coil.

### **3 EXECUTION**

#### **3.01 FANS**

- .1 Install air handler as indicated, complete with vibration isolators and seismic restraints.
- .2 Install flexible connections on inlet ductwork and on discharge ductwork. Ensure metal bands of connectors are parallel with minimum 25 mm flex between ductwork and fan during running.
- .3 Install connectors such that connectors are clear of the air stream. Provide flange extensions as necessary. Ensure accurate alignment of duct to fan.
- .4 Provide safety screens where fan inlet or outlet is exposed.
- .6 Provide and install sheaves and belts required for final air balance.

**END OF SECTION**

**Part 1 General**

**1.1 SECTION INCLUDES**

- .1 Air cooled condensing units.
- .2 Controls and control connections.
- .3 Refrigerant piping and connections.
- .4 Refrigerant specialties.

**1.2 RELATED SECTIONS**

- .1 Section 23 05 00 - Mechanical Requirements.
- .2 Section 26 09 00 - Controls.

**1.3 SUBMITTALS**

- .1 Section 01 33 00: Submittal Procedures.
- .2 Shop Drawings:
  - .1 Indicate general assembly of specialties, rated capacities, weights, accessories, electrical requirements, wiring diagrams, dimensions, weights and loading, required clearances, and location and size of field connections. Include schematic layouts showing condenser, refrigeration compressors, cooling coils, refrigerant piping and accessories required for complete system.
  - .2 Submit design data indicating pipe sizing.
- .3 Installation Data: Manufacturer's special installation requirements.
- .4 Manufacturer's Certificate: Certify that specified Products meet or exceed specified requirements.

**1.4 CLOSEOUT SUBMITTALS**

- .1 Section 01 78 00: Closeout Submittals.
- .2 Operations and Maintenance Data: Submit operation and maintenance data including start-up instructions, maintenance data, parts lists, controls and accessories.
- .3 Record Documentation: Accurately record actual locations of equipment and refrigeration accessories.

**1.5 QUALITY ASSURANCE**

- .1 Manufacturer Qualifications: Company specializing in manufacturing the Products specified in this section with minimum three (3) years documented experience.

**1.6 WARRANTY**

- .1 Warranty Period: Five (5) years coverage for refrigerant compressors and motors.

**Part 2 Products**

**2.1 PIPING**

- .1 Copper Tubing: Type ACR hard drawn or annealed, wrought copper fittings, 95/5 solder or silver braze joints to 22 mm OD, Type K, annealed, cast copper fittings, flared joints].

**2.2 REFRIGERANT**

- .1 Refrigerant: Type R-410a

**2.3 AIR COOLED CONDENSING UNITS**

- .1 Air Cooled Outdoor Heat Pump Unit: Self-contained, packaged, factory assembled and pre-wired units suitable for outdoor use consisting of cabinet, compressors, condensing coil and fans, integral sub-cooling coil, controls, liquid receiver, and screens.
  - .1 Heat Rejection Capacity:  
13 KW (44,300 MBH) total cooling capacity, at 29°C DB/19°C WB (85 DB/67°F)
  - .2 Casing: House in galvanized steel panels, baked enamel finish. Provide removable access doors or panels with quick fasteners. Mount starters, disconnects, and controls in weatherproof panel provided with fully opening access doors.
  - .3 Condenser Coils: Aluminum fins mechanically bonded to seamless copper tubing, with sub-cooling circuits, air tested to 2900 kPa, vacuum dehydrated and sealed
  - .4 Fans:
    - .1 Vertical discharge direct driven propeller type condenser fan with fan guard on discharge.
  - .5 Motors: Suitable for outdoor use, single phase permanent split capacitor, with permanent lubricated ball bearings and built in [current and] thermal overload protection.
  - .6 Refrigerant Circuit:
    - .1 Provide each unit with one (1) refrigerant circuit factory supplied and piped with filter dryer, liquid line sight glass and moisture indicator, thermal expansion valve, insulated suction line, suction and liquid line service valves.
    - .2 For heat pump units, provide reversing valve, suction line accumulator, flow control check valve, and solid state defrost control utilizing thermistors.

**2.4 AIR COOLED CONDENSING UNIT CONTROLS**

- .1 Control Panel: Mount weatherproof steel control panel on unit, containing power and control wiring, disconnect switch, factory wired with single point power connection.



- .1 Control Devices: For each compressor, provide starter, non-recycling compressor overload, starter relay, and control power transformer or terminal for controls power, manual reset current overload protection. For condenser fan, provide across-the-line starter with starter relay.
- .2 Safety Controls: Provide safety controls arranged to shut down machine
  - .1 High discharge pressure switch
  - .2 Low suction pressure switch automatic reset.
  - .3 Oil pressure switch (manual reset).
- .3 Operating Controls: See 26 09 00 Controls
- .4 Operating Temperatures: Provide controls to permit operation down to <- 10 degrees C ambient temperature at minimum load.
  - .1 Thermostat to cycle fan motors in response to outdoor ambient temperature.
  - .2 Head pressure switch to cycle fan motors in response to refrigerant condensing pressure.
  - .3 Solid state control to vary speed of one condenser fan motor in response to refrigerant condensing pressure.
- .2 Provide pre-piped gage board with pressure gages for suction and discharge refrigerant pressures, and oil pressures.
- .3 Thermostat: Provide low voltage, adjustable thermostat to control 2 heating stages in sequence with delay between stages, and supply fan to maintain temperature setting,
  - .1 Include system selector switch [(off-heat 1-heat 2-auto-cool)] and fan control switch (auto-on).
- .4 Provide electric solid state microcomputer based room thermostat, located as indicated.

### **Part 3 Execution**

#### **3.1 INSTALLATION**

- .1 Install equipment and specialties to manufacturer's written instructions.
- .2 Install piping to conserve building space and not interfere with use of space. Route piping in orderly manner, plumbing and parallel to building structure, and maintain gradient. Group piping whenever practical at common elevations and locations. Slope piping one percent in direction of oil return.
- .3 Provide non-conducting dielectric connections when joining dissimilar metals.
- .4 Install piping to allow for expansion and contraction without stressing pipe, joints, or connected equipment. Provide clearance for installation of insulation and access to valves and fittings.
- .5 Locate expansion valve sensing bulb immediately downstream of evaporator on suction line. Provide external equalizer piping on expansion valves with refrigerant distributor

**3.2 APPLICATION**

- .1 Provide line sized liquid indicators in main liquid line leaving condenser or in liquid line leaving receiver.
- .2 Provide line size strainer upstream of each automatic valve. Where multiple expansion valves with integral strainers are used install single main liquid line strainer.
- .3 On steel piping systems provide strainer in suction line.
- .4 Provide shut-off valve on each side of strainer.
- .5 Provide replaceable cartridge filter-driers vertically in liquid line adjacent to receivers with three valve bypass assembly to permit isolation of driers for servicing.
- .6 Utilize flexible connectors at or near compressors where within piping configuration does not absorb vibration.

**3.3 FIELD QUALITY CONTROL**

- .1 Field inspection and testing will be performed under provisions of Section 01 70 00.
- .2 Provide initial and cooling season start-up, and winter season shut down during first year of operation, including routine servicing and check out.
- .3 Supply service of factory trained representative for a period of 1 days to supervise testing, dehydration and charging of machine, start-up, and instruction on operation and maintenance to Owner.
- .4 Supply initial charge of refrigerant and oil for each refrigerant circuit. Replace losses of refrigerant and oil.

END OF SECTION

**Part 1 General**

**1.1 SECTION INCLUDES**

- .1 Push button and selector switches.
- .2 Relays.
- .3 Time delay relays.
- .4 Control power transformers.
- .5 Sequence of Operation.

**1.2 SUBMITTALS**

- .1 Section 01 33 00: Submittal Procedures.
- .2 Product Data: Submit product data for each component specified.
- .3 Shop Drawings: Indicate control panel layouts, wiring connections and diagrams, dimensions, support points.
- .4 Installation Data: Installation Data: Manufacturer's special installation requirements.
- .5 Manufacturer's Certificate: Certify that Products meet or exceed specified requirements.

**1.3 CLOSEOUT SUBMITTALS**

- .1 Section 01 78 00: Closeout Submittals.
- .2 Record Documentation: Accurately record actual locations of control equipment. Revise diagrams included in Drawings to reflect actual control device connections.

**Part 2 Products**

**2.1 CONTROL SWITCHES AND STATIONS**

- .1 Contacts: NEMA ICS2.
- .2 Contact Ratings: NEMA ICS2.
- .3 Push Button Operator: NEMA ICS2; recessed.
- .4 Initiates timed operation for duration of 30 minutes (adjustable 15 – 120 minutes).

**2.2 CONTROL RELAYS**

- .1 Contacts: NEMA ICS2
- .2 Contract Ratings: NEMA ICS2; Class [A150].
- .3 Coil Voltage: 120 volts, 60 Hz, AC.
- .4 Magnetic Control Relays: NEMA ICS2.

- .5 Transformer: NEMA ST1; machine tool transformer with isolated secondary winding.
- .6 Voltage Rating: 120 volts primary; secondary to suit.

### **Part 3 Execution**

#### **3.1 INSTALLATION**

- .1 Install devices and equipment to manufacturer's written instructions.
- .2 Install individual relays and time delay relays in enclosures.
- .3 Make electrical wiring interconnections as shown on Drawings.
- .4 Set up adjust and program controls to achieve the controls sequence as described herein.

#### **3.2 SEQUENCE OF OPERATION**

##### Occupied:

- .1 Room setpoint 21°C (adjustable)
- .2 HPI fan runs continuous
- .3 HRV fans run continuous (dry contact on Tstat)
- .4 Diverting dampers M in open position (fail open)
- .5 On T call for cooling (C-1), HPO-1 energized in cooling mode (single stage cooling)
- .6 On T first call for heating (H-1), HPO-1 energized in heating mode
- .7 On T second call for heating (H-2), pump in Combi-boiler CB-1 operates, circulating heating water to coil HC-1
- .8 On timer call from Conference room (C), diverting dampers close to bypass outdoor air and return air to Conference room, for duration of timer setting, then back to normally open position.

##### Unoccupied:

- .9 Room set point 17°C (adjustable)
- .10 HRV fans off
- .11 HPI fan runs intermittent on (H-1) or (H-2) call only
- .12 Cooling (C-1) locked out
- .13 On T first call for heating (H-1), HPO-1 energized in heating mode
- .14 On T second call for heating (H-2), pump in Combi-boiler CB-1 operates, circulating heating water to coil HC-1

- .15 On timer call from Conference room (C), HRV operates, and diverting dampers M close to bypass outdoor air and return air to Conference room, for duration of timer setting, then HRV off and dampers back to normally open position

**END OF SECTION**



## **Hazardous Building Materials Assessment**

Gulf of Georgia Cannery,  
Richmond BC



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# HAZARDOUS BUILDING MATERIALS ASSESSMENT

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# HAZARDOUS BUILDING MATERIALS ASSESSMENT

## Executive Summary

Stantec Consulting Ltd. (Stantec) was retained by Public Works and Government Services Canada (PWGSC) on behalf of Parks Canada to conduct hazardous building materials assessments within the following six buildings and structures (subject buildings) that are all located throughout the Gulf of Georgia Cannery site in Richmond, BC:

- Cannery
- Watchman's Shed
- Tank Farm
- Administrative Building
- Lead Foundry
- Oil Drum Storage.

The purpose of the assessment was to check for potential hazardous building materials that may require special attention in accordance with the requirements of the *Canada Labour Code, Part II* (Canada Labour Code), the current version of British Columbia's *Occupational Health & Safety Regulation* (BC Reg. 296/97), as well as the *Parks Canada Asbestos Management Guide* (January 2014) and the *Parks Canada Asbestos Management Standard* (January 2014).

The hazardous building materials considered included asbestos-containing materials (ACMs), lead-containing materials including lead-containing paints (LCPs), polychlorinated biphenyls (PCBs), mercury-containing items, ozone-depleting substances (ODSs), mould or moisture affected building materials, and silica.

Based on Stantec's visual assessment and on the laboratory analyses performed on samples collected, hazardous building materials were identified within the subject buildings.

A summary of our findings and recommendations is presented below. It should be noted that this summary is subject to the same restrictions and limitations as presented in Section 3.0 (Assessment Limitations) and Section 6.0 (Closure). The information provided is to be read in conjunction with the remainder of this report.

NOTE: Where particular hazardous building materials are not listed in the following table, they were not identified in that particular building.

## HAZARDOUS BUILDING MATERIALS ASSESSMENT

Summary of Identified Hazardous Building Materials	
Building Name	Identified Hazardous Building Materials
Cannery	<p><b>Asbestos</b></p> <p>The following ACMs were identified through this assessment and through previous reports.</p> <ul style="list-style-type: none"> <li>• Previously identified exterior cement panel in the following locations:               <ul style="list-style-type: none"> <li>– At the front entrance of the East Wing (exterior)</li> <li>– On the east wall of the building (exterior)</li> <li>– On the south wall of the Dryer Shed (exterior)</li> <li>– On the west wall of the Dryer Shed at the roof (exterior).</li> </ul> </li> <li>• Mechanical gasket, artifact serial #: KX.91.43.227 (Similar large mechanical gaskets were observed in the Vitamin Oil Shed)</li> <li>• Mechanical gasket, artifact serial #: KX.92.32.92</li> <li>• Mechanical gasket on artifact serial #: KX.92.32.8 (observed to be in poor condition)</li> <li>• Mechanical gasket on artifact serial #: KX.92.32.8</li> <li>• O-ring, artifact serial #: KX.93.5.373</li> <li>• Oven heat shield on artifact serial #: KX.91.42.108 (observed to be in poor condition)</li> <li>• Cement panel behind GE transformer boxes throughout</li> <li>• Grey roof panel on the Dryer Shed</li> <li>• Tan fibrous liner on the wood plank in Tank Room #3 of the Vitamin Oil Shed (observed to be in poor condition)</li> <li>• Tan/Black fibrous liner around perimeter hatch on the "HRT" boiler (observed to be in poor condition)</li> <li>• Dark brown mechanical gasket on the small tank in the northeast corner of the Boiler Room</li> <li>• White insulation on mechanical pipe straights ("Aircell") by the north west exit (observed to be in poor condition)</li> <li>• Blue pipe sealant on sprinkler piping throughout the Main Building</li> <li>• Silver mechanical gaskets on the presses in the Reduction Annex.</li> </ul> <p>Unless otherwise noted above, the materials that were accessible and observed, were noted to be in good condition.</p>

## HAZARDOUS BUILDING MATERIALS ASSESSMENT

<b>Summary of Identified Hazardous Building Materials</b>	
Cannery (Cont'd)	<p><b>Lead</b></p> <p>The following LCPs were identified through the previous assessments:</p> <ul style="list-style-type: none"> <li>• Green coloured paint on interior walls and window frames of the Evaporator and Separator Rooms (observed to be in poor condition)</li> <li>• Yellow coloured paint on interior walls and window frames of the Evaporator and Separator Rooms</li> <li>• White coloured paint on interior walls and ceilings of the Vitamin Oil Shed</li> <li>• White coloured paint on exterior walls of the Vitamin Oil Shed</li> <li>• Burgundy coloured paint on exterior trim throughout the Cannery</li> <li>• Cream coloured paint on the Cannery building ceiling and west wall (observed to be in poor condition)</li> <li>• Silver coloured paint on upper interior walls of Ice House</li> <li>• White coloured paint on lower interior walls of Ice House</li> <li>• White coloured paint on the North exterior wall</li> <li>• White coloured paint on the West exterior wall</li> </ul> <p>The following LCPs were identified as part of the current assessment:</p> <ul style="list-style-type: none"> <li>• Lime green coloured paint on the chute of the Dryer Shed/Grinding and Sacking Room</li> <li>• Silver coloured paint on the dryers in the Dryer Shed is lead-containing</li> <li>• Silver coloured paint on the oil tanks of the Vitamin Oil Shed</li> <li>• Black coloured paint on the oil tanks of the Vitamin Oil Shed</li> <li>• Grey coloured paint on the east interior wall of the Boiler Room</li> <li>• Grey coloured paint on the staircase of the Boiler Room</li> <li>• Black coloured paint on the Tea Kettle Boiler of the Boiler Room</li> <li>• Green coloured paint on the Patterson Boiler of the Boiler Room</li> <li>• Grey coloured paint on the interior walls of the West Staff Room in the East Wing</li> <li>• Teal coloured paint on the interior walls of the West Staff Room in the East Wing</li> <li>• White coloured paint on the walls of the East Wing office</li> <li>• Cream coloured paint on the interior walls of the loft level in the East Wing</li> <li>• Cream coloured paint on interior walls of the upper level Ice House</li> <li>• Red coloured paint on switch boxes on the upper level of the Ice House (observed to be in poor condition)</li> <li>• Black coloured paint on interior walls of the upper level Ice House</li> <li>• coloured White coloured paint on the interior wood columns throughout</li> <li>• Teal coloured paint on the door of the Plant Office</li> <li>• Silver coloured paint on the walls of the loft level Electrical Room</li> <li>• White coloured paint on the window trims of the Plant Office</li> <li>• White coloured paint on wood panel walls throughout</li> <li>• Blue coloured paint on the door of the loft level Electrical Room</li> <li>• Teal coloured paint on the chute in the Reduction Annex</li> <li>• Green coloured paint on the Evaporator</li> <li>• Yellow coloured paint on the Evaporator</li> <li>• Silver coloured paint on the Evaporator</li> <li>• Dark green coloured paint on the stairs of the Evaporator room</li> <li>• Silver coloured paint on the press.</li> </ul> <p>These materials were observed to be in good condition unless noted otherwise above.</p> <p>Lead is expected to be present in lead-acid batteries used in emergency lighting, older electrical wiring materials and sheathing, solder used on domestic water lines, solder used in bell fittings for cast iron pipes, solder used in electrical equipment, ceramic tile glaze and vent and pipe flashings.</p>
Cannery (Cont'd)	<p><b>PCBs</b></p> <p>Suspected PCB-containing electrical equipment was not observed.</p>

## HAZARDOUS BUILDING MATERIALS ASSESSMENT

<b>Summary of Identified Hazardous Building Materials</b>	
	<p>PCBs may also be present in plastics, molded rubber parts, applied dried paints, coatings or sealants, caulking, adhesives, paper, sound-deadening materials, insulation, or felt and fabric products such as gaskets.</p> <p>According to the Previous Reports, the following paint applications tested showed relatively low concentrations of PCB (less than 50 mg/kg):</p> <ul style="list-style-type: none"><li>• White coloured paint on the exterior north side of the Cannery – 2.2 mg/kg (Arcoclor-1248)</li><li>• Burgundy coloured paint on the door to the Boiler Room of north side of the Cannery – 4.9 mg/kg (Arcoclor-1248)<ul style="list-style-type: none"><li>– A new coat of Red paint was observed in this location during the current assessment. However, unless paint was completely removed prior to repainting then this application should still be considered to contain PCBs. Further sampling of this paint application may be required to determine management and disposal options, in the future.</li></ul></li></ul> <p><b>Mould and Moisture</b></p> <p>Mould-impacted wood panel was confirmed to be present in the East Wing staff room in the back of lockers.</p> <p><b>Mercury</b></p> <p>Mercury may be present in paints and adhesives.</p> <p><b>Ozone Depleting Substances</b></p> <p>Two York HVAC Units at the North end of the loft level were identified by labels to be ODS-containing (R-22).</p> <p><b>Silica</b></p> <p>Silica is expected to be present in vinyl floor tiles, ceiling tiles, concrete, cement and masonry block and interior wall finishes observed in various locations.</p>

## HAZARDOUS BUILDING MATERIALS ASSESSMENT

<b>Summary of Identified Hazardous Building Materials</b>	
Watchman's Shed	<p><b>Asbestos</b> The following ACMs were identified as part of the current assessment:</p> <ul style="list-style-type: none"> <li>• Grey cement paneling on the lower east wall (poor condition).</li> </ul> <p><b>Lead</b> The following LCPs were identified through the previous assessments:</p> <ul style="list-style-type: none"> <li>• Purple coloured paint on exterior trim paint, presumed to be present beneath a new coat of red paint, which was observed during the current assessment. Unless the previously-identified lead-containing purple paint was completely removed prior to repainting, then this application should still be considered an LCP.</li> </ul> <p>The following LCPs were identified as part of the current assessment:</p> <ul style="list-style-type: none"> <li>• Teal coloured paint on the interior walls</li> <li>• Green coloured paint on the floor</li> </ul> <p>These materials were observed to be in good condition.</p> <p>Lead is expected to be present in older electrical wiring materials and sheathing, solder used in electrical equipment and vent and pipe flashings.</p> <p><b>PCBs</b> Suspected PCB-containing electrical equipment was not observed. PCBs may be present in plastics, molded rubber parts, applied dried paints, coatings or sealants, caulking, adhesives, paper, sound-deadening materials, insulation, or felt and fabric products such as gaskets.</p> <p><b>Mercury</b> Mercury may be present in paints and adhesives.</p> <p><b>Silica</b> Silica is expected to be present in concrete and cement observed in various locations.</p>
Tank Farm	<p><b>Asbestos</b> The following ACMs were identified as part of the current assessment:</p> <ul style="list-style-type: none"> <li>• Grey mechanical gasket on flanges attached to the two large tanks in the Tank Farm (good condition).</li> </ul> <p><b>Lead</b> The following LCPs were identified as part of the current assessment:</p> <ul style="list-style-type: none"> <li>• Red coloured paint on the pipes (observed to be in poor condition)</li> <li>• Grey coloured paint on the tank</li> <li>• Blue coloured paint on pump (observed to be in poor condition)</li> </ul> <p>These materials were observed to be in good condition unless noted otherwise above.</p> <p>Lead is expected to be present in solder used in bell fittings for cast iron pipes.</p> <p><b>PCBs</b> Suspected PCB-containing electrical equipment was not observed. PCBs may be present in plastics, molded rubber parts, applied dried paints, coatings or sealants, caulking, adhesives, paper, sound-deadening materials, insulation, or felt and fabric products such as gaskets.</p> <p><b>Mercury</b> Mercury may be present in paints and adhesives.</p> <p><b>Silica</b> Silica is expected to be present in concrete and cement observed in various locations.</p>

## HAZARDOUS BUILDING MATERIALS ASSESSMENT

<b>Summary of Identified Hazardous Building Materials</b>	
<b>Administrative Building</b>	<p><b>Asbestos</b></p> <p>The following ACMs were identified as part of the current assessment:</p> <ul style="list-style-type: none"> <li>• Grey electrical penetration putty on the upper east wall of the mechanical room</li> <li>• 12"x12" pink stone pattern floor tile and associated mastic in the mechanical/electrical room and the archive room.</li> </ul> <p>Unless otherwise noted above, the materials that were accessible and observed, were noted to be in good condition.</p> <p><b>Lead</b></p> <p>The following LCPs were identified as part of the current assessment:</p> <ul style="list-style-type: none"> <li>• Yellow coloured paint on the curb of the east side of the building</li> <li>• White coloured paint on the interior walls throughout.</li> </ul> <p>These materials were observed to be in good condition.</p> <p>Lead is expected to be present in lead-acid batteries used in emergency lighting, older electrical wiring materials and sheathing, solder used on domestic water lines, solder used in bell fittings for cast iron pipes, solder used in electrical equipment, ceramic tile glaze and vent and pipe flashings.</p> <p><b>PCBs</b></p> <p>The approximately thirty (30) fluorescent light fixtures were observed to have high-efficiency light tubes. The ballasts within such fixtures are not suspected to contain PCBs.</p> <p>PCBs may also be present in plastics, molded rubber parts, applied dried paints, coatings or sealants, caulking, adhesives, paper, sound-deadening materials, insulation, or felt and fabric products such as gaskets.</p> <p><b>Mercury</b></p> <p>Mercury vapour is likely to be present in the light tubes/bulbs in the approximately thirty (30) fluorescent light fixtures observed throughout.</p> <p>Mercury may be present in paints and adhesives.</p> <p><b>Silica</b></p> <p>Silica is expected to be present in concrete and cement observed in various locations.</p>



## HAZARDOUS BUILDING MATERIALS ASSESSMENT

Summary of Identified Hazardous Building Materials	
Lead Foundry	<p><b>Asbestos</b> The following ACMs were identified as part of the current assessment:</p> <ul style="list-style-type: none"> <li>• Grey heat shield hanging from wood column on the west side of the building (observed to be in poor condition).</li> </ul> <p><b>Lead</b> The following LCPs were identified through the previous assessments:</p> <ul style="list-style-type: none"> <li>• Purple coloured paint on exterior trim, presumed to be present beneath a new coat of red paint, which was observed during the current assessment. Unless the previously-identified lead-containing purple paint was completely removed prior to repainting, then this application should still be considered an LCP.</li> </ul> <p>The following LCPs were identified as part of the current assessment:</p> <ul style="list-style-type: none"> <li>• White coloured paint on the interior walls.</li> </ul> <p>These materials were observed to be in good condition.</p> <p>Lead is expected to be present in older electrical wiring materials and sheathing, solder used in electrical equipment and vent and pipe flashings.</p> <p><b>PCBs</b> Suspected PCB-containing electrical equipment was not observed.</p> <p>PCBs may be present in plastics, molded rubber parts, applied dried paints, coatings or sealants, caulking, adhesives, paper, sound-deadening materials, insulation, or felt and fabric products such as gaskets.</p> <p><b>Mercury</b> Mercury may be present in paints and adhesives.</p> <p><b>Silica</b> Silica is expected to be present in concrete and cement observed in various locations.</p>

## HAZARDOUS BUILDING MATERIALS ASSESSMENT

<b>Summary of Identified Hazardous Building Materials</b>	
Oil Drum Storage	<p><b>Lead</b></p> <p>The following LCPs were identified through the previous assessments:</p> <ul style="list-style-type: none"> <li>• Yellow coloured paint on mechanical pipe on the north exterior</li> <li>• White coloured paint on exterior walls.</li> </ul> <p>The following LCPs were identified as part of the current assessment:</p> <ul style="list-style-type: none"> <li>• White coloured paint on the interior trim of the garage (good condition).</li> </ul> <p>Lead is expected to be present in older electrical wiring materials and sheathing, solder used in electrical equipment and vent and pipe flashings.</p> <p><b>PCBs</b></p> <p>The approximately nine (9) fluorescent light fixtures were observed to have high-efficiency light tubes. The ballasts within such fixtures are not suspected to contain PCBs.</p> <p>PCBs may be present in plastics, molded rubber parts, applied dried paints, coatings or sealants, caulking, adhesives, paper, sound-deadening materials, insulation, or felt and fabric products such as gaskets.</p> <p><b>Mercury</b></p> <p>Mercury vapour is likely to be present in the light tubes/bulbs in the approximately nine (9) fluorescent light fixtures observed throughout.</p> <p>Mercury may be present in paints and adhesives.</p> <p><b>Silica</b></p> <p>Silica is expected to be present in concrete and cement observed in various locations.</p>

The statements made in this Executive Summary text are subject to the same limitations included in this report, and are to be read in conjunction with the remainder of this report.

# HAZARDOUS BUILDING MATERIALS ASSESSMENT

Introduction  
March 24, 2016

## 1.0 INTRODUCTION

Stantec Consulting Ltd. (Stantec) was retained by Public Works and Government Services Canada (PWGSC) on behalf of Parks Canada to conduct hazardous building materials assessments within the buildings associated with the following National Park sites in British Columbia:

- Fort Langley National Historic Site in Langley, BC (24 buildings)
- Gulf of Georgia Cannery in Richmond, BC (5 buildings)
- Fort Rodd Hill National Historic Site in Victoria, BC (31 buildings)
- Gulf Islands National Park on Vancouver, Saturna, Prevost, Pender, Russell, Mayne and Tumbo Island, BC (45 buildings)
- Pacific Rim National Park in and between Tofino, Ucluelet and Port Renfrew, BC (39 buildings)

The general locations of the National Park sites are indicated on Drawing A1 in Appendix A.

This report presents the findings of assessment activities within the following six buildings and structures (subject buildings) that are all located throughout the Gulf of Georgia Cannery site in Richmond, BC:

- Cannery
- Watchman's Shed
- Tank Farm
- Administrative Building
- Lead Foundry
- Oil Drum Storage

The purpose of the assessment was to check for potential hazardous building materials that may require special attention in accordance with the requirements of the *Canada Labour Code, Part II* (Canada Labour Code), the current version of British Columbia's *Occupational Health & Safety Regulation* (BC Reg. 296/97) as well as the *Parks Canada Asbestos Management Guide* (January 2014) and the *Parks Canada Asbestos Management Standard* (January 2014).

The hazardous building materials considered included asbestos-containing materials (ACMs), lead-containing materials including lead-containing paints (LCPs), polychlorinated biphenyls (PCBs), mercury-containing items, ozone-depleting substances (ODSs), mould or moisture affected building materials, and silica.

The site work was conducted by Keith Irwin and Steve Chou of Stantec on July 13 and 14, 2015.

# HAZARDOUS BUILDING MATERIALS ASSESSMENT

Introduction  
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## 1.1 UNDERSTANDING OF THE PROJECT

Stantec understands that the subject buildings were constructed during time periods when hazardous building materials were commonly used in construction, and that information pertaining to the identity, location and approximate extent of hazardous building materials (if any) within the subject buildings is either not on-file or outdated. As such, and in accordance with the *Parks Canada Asbestos Management Guide* (January 2014), the *Parks Canada Asbestos Management Directive* (January 2014), the *Canada Labour Code* and *BC Reg. 296/97* pertaining to identifying hazards associated with hazardous building materials in the workplace, PWGSC commissioned this assessment on behalf of Parks Canada.

## 1.2 INFORMATION FROM PREVIOUS REPORTS

The following documentation was reviewed prior to undertaking the assessment:

- Stantec Report No. 123710616 entitled *Lead-Containing Paint and Limited Asbestos Sampling Gulf of Georgia Cannery Moncton Street, Richmond, BC*, dated March 26, 2013, prepared for PWGSC (2013 LCP Report).
- Stantec Report No. 123710616.300 entitled *Assessment of PCB and Lead Content in Paint Gulf of Georgia Cannery Moncton Street, Richmond, BC*, dated July 5, 2013, prepared for PWGSC (2013 LCP and PCB Report).
- Stantec Report No. 123220125 entitled *Assessment/Delineation of Remaining Lead-Containing Paint Exterior West Wall of the Gulf of Georgia Cannery Main Building 12138 Fourth Avenue, Richmond, BC*, dated January 5, 2015, prepared for PWGSC (2015 LCP Report).

Stantec reviewed the above-noted reports (further referred to collectively as the Previous Reports) outlined above for information purposes, and the information provided was considered in developing the current assessment and sampling plan.

Supplemental sampling of previously sampled materials was conducted in those instances where such sampling was required to bring the information into compliance with current regulations as they pertain to minimum sample numbers to appropriately characterize the sampled building materials.

Where previous sampling and analytical data indicated the presence of a hazardous building material (e.g., asbestos, lead), additional sampling was not conducted, and the material was considered to be hazardous.

# HAZARDOUS BUILDING MATERIALS ASSESSMENT

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## 2.0 SCOPE AND METHODOLOGY

Keith Irwin and Steve Chou of Stantec conducted visual assessments within the subject buildings on July 13 and 14, 2015. Site work was conducted in general compliance with the requirements of the Canada Labour Code, BC Reg. 296/97 and Stantec's Safe Work Practices (SWPs).

Mechanical systems, structures and finishes of the subject buildings were visually examined to determine the suspected presence of ACMs, lead including LCPs, PCBs, mercury, ODSs, mould, and silica. Where building materials were suspected but not confirmed to contain asbestos or lead (in paint) samples were collected for analysis to confirm or deny the presence of these hazardous materials. Based on analytical results, visually similar materials were referenced to specific analyzed samples to reduce the number of samples collected.

Additional background information and the methodology used for the determination of presence or absence of each specific hazardous material considered in this assessment are outlined in the following sections.

### 2.1 ASBESTOS

The common use of friable (materials which, when dry, can be easily crumbled or powdered by hand pressure) ACMs in construction generally ceased voluntarily in the mid-1970s but was only banned through legislation by the late 1980s. Friable asbestos was used in many building products, primarily high temperature insulations, spray-applied structural fireproofing, and a material known as vermiculite that was commonly used as block wall insulation and may be contaminated with asbestos fibres. Asbestos was also used in many non-friable manufactured products such as floor tiles, ceiling tiles, Transite cement products, and various other construction materials. Some cement products currently used in the construction of buildings may still contain asbestos.

The presence of asbestos in federal workplaces, and pertaining to federally regulated workers is governed by the *Canada Labour Code*. The presence of asbestos in the workplace in British Columbia pertaining to provincially regulated workers is governed by BC Reg. 296/97. As both federally regulated workers and provincially regulated workers (e.g., contractors) are expected to carry out work activities within the subject buildings, and as the provincial regulations are generally more prescriptive pertaining to asbestos (and generally include the requirements noted in the *Canada Labour Code*), this assessment was conducted to meet the requirements of BC Reg. 296/97.

According to the current version of BC Reg. 296/97, ACM means any material containing at least 0.5% asbestos, or vermiculite insulation with any asbestos.

Based on these criteria, a visual assessment of accessible areas was undertaken in order to check for the presence of materials suspected of containing asbestos. Locations to collect



## HAZARDOUS BUILDING MATERIALS ASSESSMENT

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discrete bulk asbestos samples of suspect building materials were identified. Samples of representative materials were then collected at these locations.

Multiple samples were collected from each "homogenous application" of observed suspected ACMs (materials suspected to contain asbestos that are uniform in material type, colour, texture application and estimated installation date) and submitted to EMSL Canada Inc. (EMSL) in Mississauga, Ontario for analysis of asbestos content using polarized light microscopy (PLM) with dispersion staining, in accordance with the United States Environmental Protection Agency (EPA) 600/R-93/116 method.

The number of samples to be collected for each homogenous application of a suspected ACM was based on accepted occupational hygiene standards and protocols, along with the assessor's experience and understanding of the consistency of that building material's application.

EMSL's analytical laboratory is accredited by the National Voluntary Laboratory Accreditation Program (NVLAP).

### 2.1.1 Sample Results Interpretation

When asbestos is detected in concentrations greater than 0.5% in one of the samples within a set that was collected to represent a "homogenous application" of a particular material (or detected in any concentration, in a set of samples collected for applications of vermiculite), the entire sample set and the entire application of that material was then considered to be an ACM.

In addition to the above, a "positive stop" option was used during the laboratory analysis of the building material samples submitted for asbestos analysis. The "positive stop" option is utilized by the laboratory when asbestos is detected at a concentration of greater than one percent in one of the samples within a set that was collected to represent a "homogenous application" of that material. At this point, further analysis of subsequent samples within the set is deemed to be unnecessary (as the entire set will be considered an ACM, per above), and the remainder of the samples within the set are not analyzed.

### 2.1.2 Potential Asbestos-Containing Vermiculite Insulation

As part of the assessment, Stantec assessed the subject buildings for areas where vermiculite insulation, a potential ACM, would likely be present. This included making note of and assessing attic spaces, floor cavities and masonry or brick walls, which are typical areas where vermiculite is found. Regarding this portion of the assessment, the following should be noted:

- Where masonry or brick walls were observed, destructive assessment (drilling) was not conducted to assess the cavity for the presence of vermiculite.

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- Where non-vermiculite attic insulation (e.g., fiberglass) was observed, inspection for the presence of vermiculite under the other insulation was conducted only at the attic access point (not throughout the attic).

### 2.1.3 Asbestos Sampling Quality Assurance/Quality Control

Sampling activities pertaining to asbestos were conducted in accordance with Stantec's SWPs, which take into account current provincial regulations pertaining to such work (i.e., sampling procedures, required number of samples, and laboratory analytical procedures).

Representative bulk samples were collected of accessible suspect ACMs in sufficient quantities for laboratory analyses. Suspect ACM samples were sealed in polyethylene zip-lock bags labeled with the sample number, suspect material description, and sample location. As part of sampling procedures, sampling tools were cleaned between sample collection events to avoid the potential for cross-contamination of samples.

Sample bags were compiled in order and placed into a single container accompanied with a Chain of Custody form outlining the project information, date, building location, number of samples, and sample description. Samples were submitted to the analytical laboratory in a sealed container via courier.

## 2.2 LEAD

Lead may be used in its pure metallic form or combined chemically with other elements to form lead compounds. Metallic lead is used to make products such as electric storage batteries, ammunition, lead solder, radiation shields, pipes, and sheaths for electric cables. Metallic lead is sometimes combined with other metals such as copper, tin, and antimony as lead alloys for use in the manufacture of a variety of metal products. Lead is commonly found in buildings in the solder used on copper domestic pipes, in the caulking on bell fittings of cast iron drainage pipes and in electrical equipment.

The presence of lead-containing materials (other than paint) was assessed through visual means.

With respect to paint, the lead content of interior paint was limited to 0.5% by weight (equivalent to 5,000 mg/kg or ppm) in 1976 under the Federal *Hazardous Products Act*, which governs the import, export and distribution of hazardous products in Canada. In 2005, the *Hazardous Products Act* had reduced the criteria for surface coatings (including paint) to 600 mg/kg (600 ppm) to define them as "lead-containing". This criterion has since (2010) been reduced to 90 ppm.

However, with respect to potential lead exposures associated with disturbance to surfaces coated with lead-containing products, WorkSafeBC has compiled a manual titled *Lead-Containing Paint and Coatings: Preventing Exposure in the Construction Industry*, (Lead Guideline) which defines a "lead-containing surface coating material" and indicates that "...the improper removal of lead paint containing 600 mg/kg lead results in airborne lead

## HAZARDOUS BUILDING MATERIALS ASSESSMENT

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concentrations that exceed half of the exposure limit". As such, Stantec will reference this value (600 ppm) in defining paints as "lead-containing".

Based on this criterion, samples of suspected LCPs were collected from major paint applications, and were collected to substrate, where possible, in sufficient quantity to conduct analyses for total lead content. Samples collected were placed into separate, sealed, and labeled polyethylene bags, and submitted to EMSL for analyses of total lead content using Flame Atomic Absorption Spectrometry AAS (SW 846 3050B\*/7000B).

EMSL's analytical laboratory is also accredited by the American Industrial Hygiene Association (AIHA) Environmental Lead Laboratory Approval Program.

### 2.3 POLYCHLORINATED BIPHENYLS

PCBs were used widely as coolants and lubricants in transformers, capacitors, and other electrical equipment. In fluorescent fixtures, PCBs were usually found within the small capacitors inside the ballast that controls the lamp. The Federal *Chlorobiphenyls Regulation, SOR/91-152*, prohibited the use of PCBs in electrical equipment manufactured after July 1, 1980.

The presence of PCB-containing equipment was assessed through visual means. With respect to fluorescent lamp ballasts, due to the risk of electrical shock associated with dismantling operating fixtures, fluorescent lamp ballasts were not removed to view identification numbers/information.

The total number of fluorescent lamp fixtures that may have ballasts that contain PCBs was approximated for each building assessed.

Suspected PCB-containing electrical equipment can be visually inspected and compared to the Environment Canada reference guide entitled *Identification of Lamp Ballasts Containing PCBs, Report EPS 2/CC/2*, dated August 1991 (PCB Guide).

### 2.4 MERCURY

Mercury is commonly found in buildings as mercury vapour lighting, thermostats/thermometers with mercury-containing glass ampoules, electrical switches and can also be found in minor amounts in fluorescent lamp tubes and vapour bulbs and may be present in stable forms in adhesives. Exposure to mercury in federal workplaces is governed by the *Canada Labour Code*, while provincially it is governed by *BC Reg. 296/97*.

The presence of mercury and mercury-containing equipment was assessed through visual means.



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### 2.5 MOULD

Moist building materials may provide suitable conditions for mould growth, and the removal of building materials impacted by mould growth may require workers with specific training and experience using work procedures that have been developed to protect workers and work areas from exposure to elevated concentrations of airborne mould.

The presence of suspect visible mould was assessed through visual means and sampling. Material observed with dark-coloured staining and/or a textured and discoloured appearance is described as "suspect mould". Mould identified visually is defined as "suspect mould" unless it is confirmed as mould by laboratory analysis.

#### 2.5.1 Mould Reference Guidelines

With respect to mould and/or moisture, the visual assessment procedures utilized during this project were based on the recommendations provided in the documents listed below:

- Standard Construction Document CCA 82 *Mould Guidelines for the Canadian Construction Industry*, Canadian Construction Association, 2004 (referred to as CCA 82)
- *Guidelines on Assessment and Remediation of Fungi in Indoor Environment*, New York City Department of Health, Bureau of Environmental and Occupational Disease Epidemiology, April 2000 (referred to as the NYC Guidelines)
- *Fungal Contamination in Public Buildings: Health Effects and Investigation Methods*, Federal-Provincial Committee on Environmental and Occupational Health, 2004 (referred to as the Health Canada Guide)
- *Indoor Air Quality in Office Buildings: A Technical Guide*, report of the Federal-Provincial Advisory Committee on Environmental and Occupational Health, 1995 (referred to as the IAQ Guide)
- *Bioaerosols: Assessment and Control*, American Conference of Governmental Industrial Hygienists (ACGIH), 1999 (referred to as the ACGIH Report)

### 2.6 OZONE-DEPLETING SUBSTANCES

Chlorofluorocarbons (CFCs) and other ODSs are often found in refrigeration units associated with air-conditioning or other refrigeration equipment. In September 1987, 47 countries agreed to the Montreal Protocol on Substances that Deplete the Ozone Layer. ODSs are regulated in BC by the *British Columbia Waste Management Act—Ozone Depleting Substances and Other Halocarbons Regulation* (BC Reg. 387/99 as amended by BC Reg. 109/2002) and the *Federal Halocarbon Regulations*, 2003 (FHR 2003).

### 2.7 SILICA

Silica, also referred to as free crystalline silica, is found in concrete, cement, mortar, ceramic wall and floor tiles, stucco finishes and acoustic ceiling tiles. Prolonged exposure to, and inhalation of

## HAZARDOUS BUILDING MATERIALS ASSESSMENT

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free crystalline silica, may result in respiratory disease known as silicosis, which is characterized by progressive fibrosis of the inner lung tissue and marked shortness of breath or impaired lung function.

Exposure to silica dust is governed by *BC Reg. 296/97* According to both legislative instruments; the time-weighted average exposure limit for airborne silica dust is 0.025 mg/m<sup>3</sup>.

The presence of silica was assessed through visual means.

### 3.0 ASSESSMENT LIMITATIONS

In preparation of this report, Stantec used professional judgment based on experience. The work was conducted in accordance with generally accepted professional standards. Stantec relied on information gathered during the site investigation and laboratory analytical reports.

This report reflects the observations made within accessed areas of the subject buildings and the results of analyses performed on specific materials sampled during the assessment. Analytical results reflect the sampled materials at the specific sample locations.

Sampling was conducted pertaining to suspected ACMs and suspected LCPs only. The assessment for the presence of other hazardous building materials was visual in nature, and was conducted pertaining to readily visible surfaces within accessible spaces only. Concealed spaces were inspected via existing access panels, where present. Interior and exterior finishes, solid ceilings, walls, flooring and structural elements were not removed to access concealed areas.

The following areas were not accessed, for the reasons indicated:

- Sloped roof portions (lack of safe access)
- Vitamin Oil Shed Tank Room #2 (key not available).

As such, limited comments, if any, will be provided regarding the presence, quantity or condition of hazardous building materials within the above-noted areas.

In addition to the above, and due to limitations on the agreed to scope of work for this project as well as physical limitations in accessing concealed areas and limitations associated with working in occupied/operational spaces, there are specific limitations to the information that can be provided to each hazardous building material considered in this assessment, as outlined in the following sub-sections.

### 3.1 ASBESTOS

Suspected ACMs that were not sampled include, but are not limited to, the following (where present, based on building construction or as otherwise noted):



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- Roofing materials associated with buildings where the roof could not be accessed safely with the equipment present on-site
- Sub-grade materials
- Interior components of mechanical equipment (e.g., inner linings or gaskets in boilers)
- Interior components of heating, ventilation and air conditioning (HVAC) units
- Heat protection materials inside mechanical installations (e.g., gaskets) and light fixtures (e.g., paper backing in sealed incandescent fixtures)
- Flooring material concealed beneath ceramic tile, brickwork, hardwood flooring, and/or concealed beneath existing sub-floors
- Drywall and/or wall plaster and associated finish materials concealed behind new and/or additional walls or ceilings
- Woven tape inside duct connection joints or inner ducting insulation
- Materials within sealed/hard wall cavities, hard ceiling cavities or crawlspaces without appropriate access points
- Insulation materials inside fire doors
- Insulation materials in attic, ceiling or crawlspace areas beyond reasonable reach from safe access points
- Ceramic tile grout.

If encountered during renovation, demolition or other activities, any suspected ACMs not identified within this report should be presumed to contain asbestos and handled as such until otherwise proven, through analytical testing.

### 3.1.1 Cannery – Artifacts

A large collection of "artifacts" is present throughout the loft area of the main Cannery building. Many of these artifacts are mechanical components used during the operational era of the Cannery and as such, ACMs may be present in the collection. Various suspected ACM artifacts were sampled as directed by Parks Canada staff. This sampling was intended to provide information about the types of ACM materials which may be present within the collection but does not constitute a comprehensive assessment of all of the artifacts. Artifacts that are suspected to have ACM components and that were not sampled as part of this assessment should be presumed to contain asbestos until proven otherwise by analytical testing.

### 3.1.2 Cannery – Mechanical Equipment on Display

Mechanical equipment used during the operational era of the Cannery is also on display throughout the main Cannery building. This equipment was visually inspected and samples of readily accessible suspected ACMs were collected. Mechanical equipment was not dismantled in order to assess internal components for the presence of suspected ACMs. As such, if mechanical equipment is to be dismantled any suspected ACMs discovered during this process should be presumed to contain asbestos until proven otherwise by analytical testing.

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### 3.2 LEAD

Assessment for the presence of lead or lead-containing materials was visual in nature, and was conducted pertaining to readily visible surfaces within accessible spaces of the subject buildings only. The presence of lead or lead-containing materials in inaccessible areas not assessed included, but was not limited to: ceiling spaces, wall cavities, crawlspaces, and buried materials.

With respect to paint, samples of suspected LCPs were collected within the subject buildings only from surfaces of major paint applications where visually different paint colours and/or types were identified. Although the surfaces where samples were collected may be covered with more than one coat of paint, the paint samples are described by the surface (visible) colour only.

Attempts were made to represent all layers of paint in the samples collected. As analytical results are referenced to the surface paint colour only, the lead content of all painted surfaces similar to that represented by the surface paint colour will be presumed to be the same, regardless of differing sub surface paints, if any.

### 3.3 POLYCHLORINATED BIPHENYLS

Due to height restrictions and the risk of electrical shock in handling operational light fixtures, the ballasts present in the fixtures observed within the subject buildings were not removed for comparison to the PCB Guide. The visible labels of ballasts in several fixtures were inspected for comparison to the PCB Guide.

Conclusions and recommendations regarding the presence of PCBs within the subject buildings are based on Stantec's limited observations in combination with information provided by staff regarding lighting renovations (where requested by Stantec based on observations) and is presented to provide guidance regarding the likelihood that PCB-containing equipment is or is not present within the subject buildings. The exact extent and/or number of fluorescent lamp ballasts containing PCBs, if any, within the subject buildings will not be commented on.

### 3.4 MERCURY

Visual assessment for the presence of mercury-containing equipment within the subject buildings was conducted in accessible areas only. The presence of mercury or mercury-containing equipment in inaccessible areas includes, but is not limited to: ceiling spaces, wall cavities, and crawlspaces, or as internal parts of HVAC mechanisms.

### 3.5 MOULD

Visual assessment for the presence of suspected visible mould and/or suitable conditions for mould growth (e.g., moist and/or water-stained building materials) were conducted in accessed portions of the subject buildings only. The assessment was not intrusive in nature and included visual assessment of exposed surfaces and closer inspection of known problem areas.

## HAZARDOUS BUILDING MATERIALS ASSESSMENT

Findings  
March 24, 2016

The conclusions made in this report provide description(s) of the potential source(s) of moisture within the subject buildings that may have led to suitable conditions for mould growth, only in those cases where potential source(s) of moisture were identified. These conclusions will not necessarily identify all sources of moisture leading to suitable conditions for mould growth within the subject buildings or within the impacted area(s).

This assessment does not constitute a building envelope/building systems assessment, which would include an intrusive investigation to assess the internal condition, potential moisture sources, and expected remaining service life of the various components and systems comprising the envelope of a building.

### 3.6 OZONE DEPLETING SUBSTANCES

Visual assessment for the presence of ODSs within the subject buildings was conducted in accessible areas only. The presence of ODS-containing equipment in inaccessible areas including, but not limited to, ceiling spaces, wall cavities and crawlspaces, was not assessed. In addition, portable equipment that may contain ODSs (refrigerators, drink coolers, etc.) was not considered as part of this assessment.

### 3.7 SILICA

Visual assessment for the presence of silica-containing materials within the subject building was conducted in accessible areas only. The presence of potential silica-containing materials in inaccessible areas including, but not limited to, ceiling spaces and wall cavities was not assessed.

## 4.0 FINDINGS

Floor plans showing bulk sample locations and locations of identified hazardous materials (where practical) are provided in Appendix A.

The results of the assessment for each of the considered hazardous materials are provided in the following sub-sections.

### 4.1 ASBESTOS

Building-by-building summary lists of the samples collected during this assessment including descriptions of the sample types, sampling locations and laboratory analytical results are provided in Tables B-1 through B-6 in Appendix B. Copies of the Laboratory Certificates of Analysis for asbestos samples analyzed are included in Appendix C.

Based on our observations of building construction (estimated vintage of interior finishes and uniformity of building material use) and on our interpretations of the analytical results of suspected ACM samples collected during this assessment as well as the information provided in



## HAZARDOUS BUILDING MATERIALS ASSESSMENT

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In the Previous Reports, the materials presented in Tables D-1 through D-5 in Appendix D were identified as ACMs. This table also provides information regarding the asbestos content of the material, its condition, location and friability, as well as representative photographs of the material (where available).

### 4.1.1 Potential for Vermiculite Insulation

It should be noted that various walls of the subject buildings were comprised of masonry (concrete) blocks. Asbestos-contaminated vermiculite was historically used as insulating material in masonry block or brick walls, may be present. To assess for this potential ACM, destructive sampling is required, which was not conducted as part of this assessment. Although various holes, breaches and cracks were observed and no vermiculite was present, the presence of this potential ACM cannot be ruled out without destructive testing.

### 4.1.2 Materials with <0.5% Asbestos

It should be noted that various materials tested as part of this assessment were found to contain asbestos in trace concentrations (<0.25%) in some samples, as summarized below:

- Cannery
  - Roof material over staircase for Dryer Shed (< 0.25% chrysotile asbestos detected in two samples, no asbestos detected in the third sample)
  - Vent sealant on roof (< 0.25% chrysotile asbestos detected in one sample, no asbestos detected in the other two samples)
  - Insulation on the Tea Kettle boiler in the Boiler room (< 0.25% chrysotile asbestos detected in one sample, no asbestos detected in the other two samples)

As the number of samples collected for each of the above-noted homogenous applications would be considered sufficient to appropriately characterize that material based on published provincial standards (BC Asbestos Guide), the above-noted materials are not considered to be ACMs.

## 4.2 LEAD

Building-by-building summary lists of the samples collected during this assessment including descriptions of the sample types, sampling locations and laboratory analytical results are provided in Tables E-1 through E-6 in Appendix E. Copies of the Laboratory Certificates of Analysis for paint chip samples analyzed are included in Appendix F.

Based on our observations and on our interpretations of the analytical results of suspected LCP samples collected during this assessment as well as the information provided in the Previous Reports, the materials presented (on a building-by-building basis) in Tables G-1 through G-6 in Appendix G were identified as LCPs. This table also provides information regarding the lead content of the paint, its condition and location, as well as representative photographs of the paint (where available).

## HAZARDOUS BUILDING MATERIALS ASSESSMENT

Findings

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In addition to paint, lead is expected to be present in the following within the subject buildings:

- Lead-acid batteries used in emergency lighting
- Older electrical wiring materials and sheathing
- Solder used on domestic water lines
- Solder used in bell fittings for cast iron pipes
- Solder used in electrical equipment
- Ceramic tile glaze
- Vent and pipe flashings.

### 4.3 POLYCHLORINATED BIPHENYLS

The following observations were made pertaining to potential PCB-containing electrical equipment:

- Cannery, Tank Farm and Lead Foundry
  - No suspected PCB-containing electrical equipment or stored items were observed.
- Administrative Building
  - Approximately 30 fluorescent light fixtures with high-efficiency light tubes were observed. The ballasts within such fixtures are not suspected to contain PCBs.
- Oil Drum Storage
  - Approximately nine fluorescent light fixtures with have high-efficiency light tubes were observed. The ballasts within such fixtures are not suspected to contain PCBs.

PCBs may also be present in plastics, molded rubber parts, applied dried paints, coatings or sealants, caulking, adhesives, paper, sound-deadening materials, insulation, or felt and fabric products such as gaskets.

#### 4.3.1 PCBs in Paint

Sampling and/or assessment for PCBs in paint was not within the scope of the current assessment.

According to the 2013 LCP and PCB Report, relatively low concentrations of PCB (less than 50 mg/kg) were detected in the following paints associated with the Cannery:

- White coloured paint on the exterior north wall of the Cannery – 2.2 mg/kg (Arcochlor-1248)
- Burgundy coloured paint on the door trim to the Boiler Room of north wall of the Cannery – 4.9 mg/kg (Arcochlor-1248).

During the current assessment, a new coat of red paint was observed on the materials that were previously observed to be coated with the above-noted burgundy paint. It should be noted that unless the old paint was completely removed prior to repainting, then this new red paint application should still be considered to contain PCBs. Further sampling of this paint application may be required to determine management and disposal options, in the future.



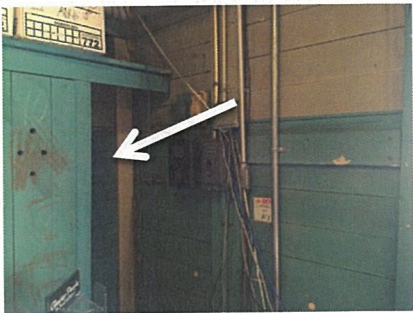
## HAZARDOUS BUILDING MATERIALS ASSESSMENT

Findings  
March 24, 2016

### 4.4 MOULD

The observations pertaining to mould and moisture that were made during this assessment are summarized in Table 4-1 below.

**Table 4-1 Mould/Moisture Observations Summary  
Gulf of Georgia Cannery, 12138 - 4 Avenue, Richmond, BC**

Building and Area	Observation	Suspected Source of Moisture	Photo
Cannery East Wing staff room, in the back of the lockers	Confirmed mould-stained wood panel inside lockers (see below for analytical results)	Condensation	
Watchman's Shed Tank Farm Administrative Building Lead Foundry Oil Drum Storage	No suspected mould and/or moisture-impacted building materials observed	N/A	N/A

#### 4.4.1 Surface Sampling – Cannery

Table 4-2, below, summarizes the locations and analytical results of the bulk surface samples collected from the Cannery during this assessment. A copy of the sample analytical report provided by Sporometrics is attached in Appendix H.

**Table 4-2 Surface Sample Collection and Analysis Summary  
Gulf of Georgia Cannery, 12138 - 4 Avenue, Richmond, BC**

Sample No.	Sample Location	Microscopic Observation	Mould Growth Indicated?
EW-MS-01	Cannery – East Wing – staff room locker (west)	Hyphal fragments, pigmented	Yes



## HAZARDOUS BUILDING MATERIALS ASSESSMENT

Findings  
March 24, 2016

### 4.5 MERCURY

The following observations were made pertaining to potential mercury-containing items:

- Cannery, Watchman's Shed, Tank Farm and Lead Foundry
  - No suspected mercury-containing items were observed.
- Administrative Building
  - Mercury vapour is likely to be present in the light tubes within thirty (30) fluorescent light fixtures observed.
- Oil Drum Storage
  - Mercury vapour is likely to be present in the light tubes within nine (9) fluorescent light fixtures observed.

Mercury may also be present in paints and adhesives.

### 4.6 OZONE DEPLETING SUBSTANCES

The following equipment was identified by labels to be ODS-containing:

Building	Equipment	Location	Refrigerant
Cannery	York HVAC Units (2 units)	North end on the loft Level	R-22 (6 lbs. total)
Watchman's Shed Tank Farm Administrative Building Lead Foundry Oil Drum Storage	None observed	N/A	N/A

The locations of the confirmed ODS-containing equipment are indicated in the floor plan drawings provided in Appendix A.

### 4.7 SILICA

Silica is expected to be present in vinyl floor tiles, ceiling tiles, concrete, cement and masonry block and interior wall finishes observed in various locations throughout the subject buildings.

## HAZARDOUS BUILDING MATERIALS ASSESSMENT

Recommendations

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### 5.0 RECOMMENDATIONS

#### 5.1 ASBESTOS

For buildings/structures with identified ACMs, Stantec recommends the following with regards to meeting the requirements of the *Canada Labour Code, BC Reg. 296/97*, the *Parks Canada Asbestos Management Guide* (January 2014) and the *Parks Canada Asbestos Management Standard* (January 2014) as they pertain to managing asbestos in the workplace and/or managing asbestos during renovation/demolition projects:

- Damaged ACMs should be removed and disposed of by an experienced asbestos abatement contractor, in accordance with the procedures and regulations outlined in *BC Reg. 296/97* and the *BC Asbestos Guide*. This would include the following:
  - Cannery
    - Remove and dispose of the mechanical gasket on artifact serial #: KX.92.32.8.
    - Remove and dispose of the oven heat shield on artifact serial #: KX.91.42.108.
    - Remove and dispose of approximately 5 square feet of tan fibrous liner on the wood plank in tank room #3 of the vitamin oil shed.
    - Remove and dispose of the tan fibrous liner around the perimeter of the hatch on the "HRT" boiler.
    - Remove and dispose of approximately 20 linear feet of white Aircell mechanical pipe insulation by the north west exit.
  - Watchman's Shed
    - Remove and dispose of approximately 8 square feet of grey cement paneling on the lower east wall.
  - Lead Foundry
    - Remove and dispose of approximately 1 square foot of grey heat shield hanging from wood column on the west side of the building.
- Identified ACMs in good condition can be managed in place in accordance with the requirements of the *Parks Canada Asbestos Management Guide* (January 2014) and the *Parks Canada Asbestos Management Standard* (January 2014).
- Asbestos-containing materials that may be impacted during renovations and/or demolition activities should be removed by an experienced asbestos abatement contractor, in accordance with the procedures and regulations outlined in *BC Reg. 296/97* and the *BC Asbestos Guide*, and prior to the renovation and/or demolition activities.
- Should a material suspected to contain asbestos fibres become uncovered during renovation and/or demolition activities, all work in the areas that may disturb the material should be stopped. Samples of the suspect material should be submitted for laboratory analysis to determine if asbestos fibres are present. Confirmed asbestos materials should be handled in accordance with applicable guidelines and regulations.
- Suspected ACMs deemed visually similar to the ACMs identified in this report (on a building-by-building basis) should be considered asbestos-containing and handled as such, unless proven otherwise, through analytical testing.

## HAZARDOUS BUILDING MATERIALS ASSESSMENT

Recommendations  
March 24, 2016

- Asbestos-containing cement pipe may be present below ground—caution should be used if excavation is required.
- If masonry block walls are to be impacted by renovation and/or demolition work, and these walls have not been checked for the presence of vermiculite insulation, intrusive assessments for vermiculite should be undertaken prior to renovation/or demolition work. If vermiculite insulation is suspected to be present, this material should be treated as an ACM until testing can show otherwise.
- Ensure asbestos containing waste is handled, stored, and disposed of in accordance with the requirements of the Federal Transportation of Dangerous Goods Regulation and the *British Columbia Hazardous Waste Regulation (BC Reg. 63/88)*.

### 5.2 LEAD

Lead-containing paint observed in poor condition throughout should be cleaned-up and/or addressed to mitigate potential for additional deterioration and dispersal of lead-containing paint chips/dust. This would include the following:

- Cannery
  - Green coloured paint on interior walls and window frames of the Evaporator and Separator Rooms
  - Cream coloured paint on the Cannery building ceiling and west wall
  - Red coloured paint on switch boxes on the upper level of the Ice House.
- Tank Farm
  - Red coloured paint on the pipes
  - Blue coloured paint on pumps.

Consideration should be given to re-painting surfaces to mitigate the potential for additional deterioration and hazards associated with the lead-containing paint chips/dust that may be created. If re-painting is completed, appropriate precautions to protect workers and work areas from exposure to lead will be required during painting preparation activities.

If LCPs or other lead-containing equipment/materials within the subject buildings are to be disturbed and/or removed, ensure compliance with the following:

- The exposure protection requirements of the *BC Reg. 296/97*.
- The disposal requirements of the *British Columbia Hazardous Waste Regulation (BC Reg. 63/88)*.
- The transportation requirements of the *Federal Transportation of Dangerous Goods Regulation*.

Corrective action or remedial work on paint applications containing any concentration of lead should be undertaken in a manner so as to avoid generating fine particulate matter or dust (i.e., avoid sanding). Airborne lead dust or fumes should not exceed the *BC Reg. 296/97* 8-hour Occupational Exposure Limit (OEL) of 0.05 milligram per cubic metre (mg/m<sup>3</sup>) during the removal of paints and products containing any concentration of lead. The use of personal protective

## HAZARDOUS BUILDING MATERIALS ASSESSMENT

Recommendations

March 24, 2016

equipment is recommended to reduce the potential for over-exposure to lead dust. This can be achieved by:

- Providing workers with protective clothing and PPE or devices as necessary to protect the worker against the hazards to which the worker may be exposed.
- Providing workers with adequate and training in the care and use of clothing, equipment or device before wearing or using it.
- Wetting the surface of the materials to prevent dust emissions.
- Providing workers with washing facilities with clean water, soap and individual towels to properly wash prior to exiting the work area.

To avoid the inhalation of lead, it is essential to have the following control methods in place:

- Engineering controls
- Work practices and hygiene practices
- Respirators and personal protective equipment
- Training.

The work tasks required and the ways in which lead-containing materials (including paints) will be impacted will determine the appropriate respirators, measures and procedures that should be followed to protect workers from lead exposure.

Lead-containing materials, including paints, can be managed in place, where in good condition.

### 5.3 POLYCHLORINATED BIPHENYLS

When decommissioned, and if fluorescent light fixtures of older vintage (without high-efficiency light tubes) are discovered in concealed locations or areas not accessed, verify the PCB content of ballasts as per the Environment Canada publication *Identification of Lamp Ballasts Containing PCBs*, 1991. In the unlikely event that PCB-containing items are identified for removal and disposal, they should be handled, transported, stored and disposed of in accordance with the following:

- The disposal requirements of the *British Columbia Hazardous Waste Regulation (BC Reg. 63/88)*
- The transportation requirements of the *Federal Transportation of Dangerous Goods Regulation*
- The *Federal PCB Regulations (SOR/2008-273)*.

Should a material suspected to contain PCBs become uncovered during renovation activities (i.e., dielectric fluids, hydraulic fluids), all work in the areas that may disturb the material should be stopped. Samples of the suspect material should be submitted for laboratory analysis to determine if PCBs are present. Confirmed PCBs should be handled in accordance with *Federal Regulation SOR/2008-273* and *BC Reg. 63/88*.



## HAZARDOUS BUILDING MATERIALS ASSESSMENT

Recommendations  
March 24, 2016

### 5.4 MOULD

Documents published by Health Canada, Ontario Ministry of Health, American Industrial Hygiene Association (AIHA), American Conference of Governmental Industrial Hygienists (ACGIH) and others, provide guidance for interpreting the results of mold investigations. The Health Canada Guide states that:

*"Identifiable promoters of fungal growth require correction, and any visible fungi require removal."*

To this end, Stantec recommends the following course of action within the subject building:

- Cannery Building:
  - Remove and replace mould impacted wood panel in the back of staff room lockers. This work should be conducted in accordance with accepted industry practices and guidelines (e.g., CCA 82), by a competent person or contractor that is knowledgeable of potential hazards of mould exposure, and appropriate remediation precautions.
  - An assessment to determine the likely source(s) of moisture impact should be undertaken. Issues leading to moisture impacts and/or mould growth should be identified and addressed prior to reinstating building materials to areas where mould abatement is conducted, to avoid the potential for re-wetting of new materials, and repeated mould growth.

### 5.5 MERCURY

Identified mercury-containing items can be managed in place, therefore no further action is recommended at this time. Mercury vapour within light fixtures poses no risk to workers or occupants provided the mercury containers remain intact and undisturbed.

Complete removal of mercury-containing equipment is required prior to renovation or demolition activities that may disturb the equipment. When mercury-containing items (e.g., fluorescent light bulbs/tubes, thermostats) are removed, ensure all mercury waste is handled, stored and disposed of in accordance with the requirements of the disposal requirements of the following:

- The disposal requirements of the *British Columbia Hazardous Waste Regulation (BC Reg. 63/88)*
- The transportation requirements of the *Federal Transportation of Dangerous Goods Regulation*.

Precautions should be taken if workers may potentially be exposed to mercury or mercury vapours to ensure that workers exposure levels do not exceed the occupational exposure limit of 0.025 mg/m<sup>3</sup> as per the *BC Reg. 296/97*. This can be achieved by providing respiratory and skin protection applicable to the hazard and task to be completed.

## HAZARDOUS BUILDING MATERIALS ASSESSMENT

Recommendations  
March 24, 2016

### 5.6 OZONE DEPLETING SUBSTANCES

ODS-containing equipment can be managed in place and must be serviced by licensed refrigeration technicians (as defined in the Federal *Halocarbon Regulations*).

When refrigeration equipment that is suspect or confirmed ODS-containing is decommissioned, it should be emptied and inspected by licensed refrigeration technician (as defined in the Federal *Halocarbon Regulations*).

If ODS-containing equipment is to be removed during demolition activities, ODSs must be handled, recycled, stored, and/or disposed of in accordance with the requirements of the following:

- *British Columbia Waste Management Act—Ozone Depleting Substances and Other Halocarbons Regulation (BC Reg. 387/99 as amended by BC Reg. 109/2002)*
- The transportation requirements of the *Federal Transportation of Dangerous Goods Regulation*
- The *Federal Halocarbons Regulations*.

### 5.7 SILICA

Silica-containing materials can be managed in place, therefore no further action is recommended at this time.

If silica-containing materials within the subject building are to be disturbed and/or removed (e.g., coring through concrete slabs, demolition of masonry or concrete units), ensure dust control measures are employed such that airborne silica dust concentrations do not exceed the exposure limit as stipulated by *BC Reg. 296/97* (Cristobalite and Quartz – each 0.025 mg/m<sup>3</sup>). This would include, but not be limited to, the following:

- Providing workers with respiratory protection
- Wetting the surface of the materials, use of water or dust suppressing agents to prevent dust emissions
- Providing workers with facilities to properly wash prior to exiting the work area.

## HAZARDOUS BUILDING MATERIALS ASSESSMENT

Closure  
March 24, 2016

### 6.0 CLOSURE

This report has been prepared by Stantec Consulting Ltd. for the sole benefit of Public Works and Government Services Canada. Any use that a third party makes of this report, or any reliance on decisions to be made based on it, is the responsibility of such third parties. Stantec Consulting Ltd. accepts no responsibility for damages, if any, suffered by any third party as a result of decisions made or actions based on this report.

The conclusions presented represent the best judgment of the assessor based on current environmental, health and safety standards and the site conditions observed on the dates cited within this report. This report is based on, and limited by, circumstances and conditions stated herein, and on information available at the time of preparation of the report. Due to the limited nature of the investigation and the limited data available, Stantec Consulting Ltd. cannot warrant against undiscovered environmental, health and/or safety liabilities. It is possible that additional, concealed hazardous materials may become evident during renovation and/or demolition activities within the subject buildings.

If any conditions become apparent that differ significantly from our understanding of conditions as presented in this report, we request that we be notified immediately to reassess the conclusions provided herein.

We trust that the report meets your current requirements. Should you have any questions or concerns regarding the above, please do not hesitate to contact the undersigned.

Respectfully submitted,

#### STANTEC CONSULTING LTD.

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KW/TW/SB/dsc

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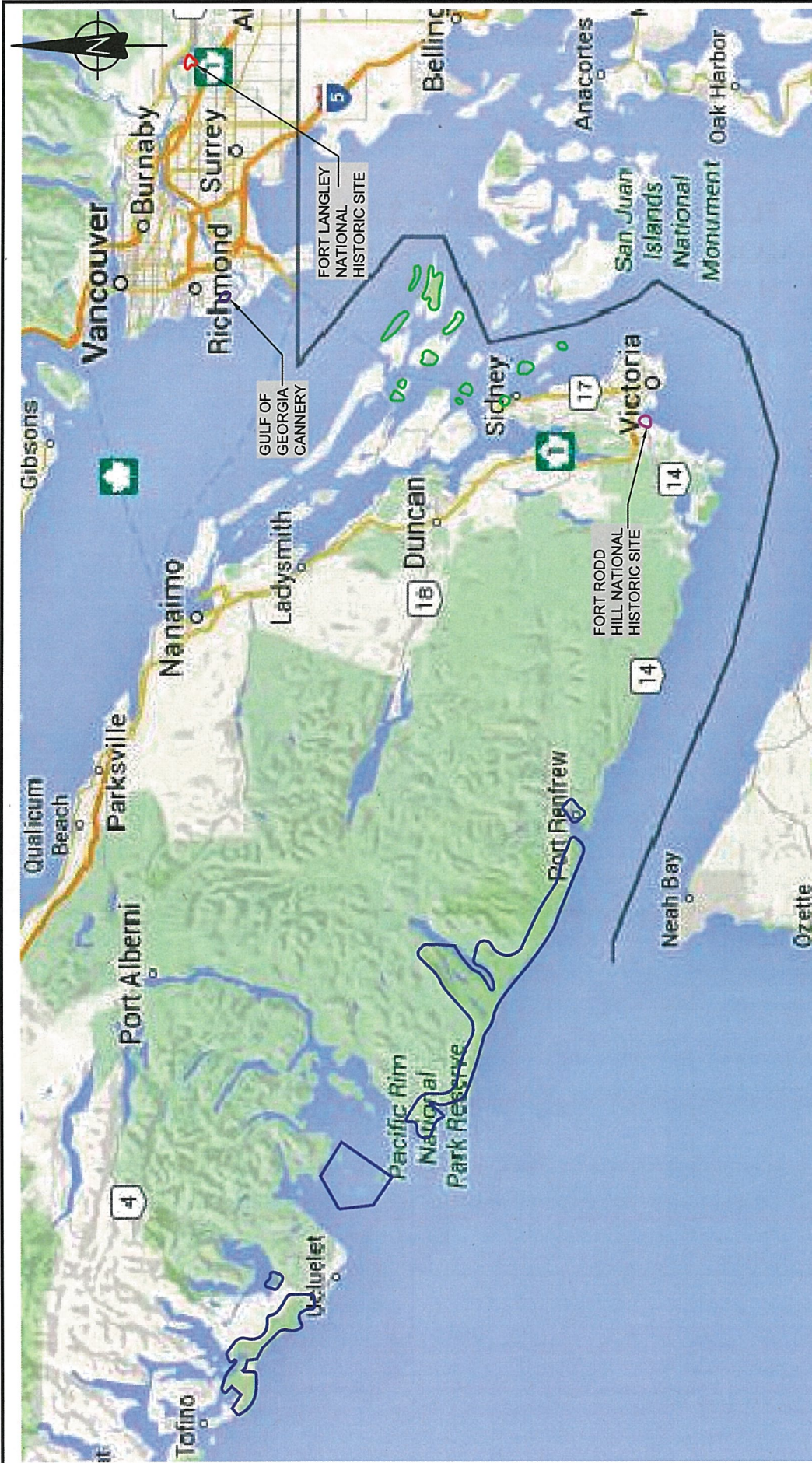
## HAZARDOUS BUILDING MATERIALS ASSESSMENT

Appendix A Floor Plans Showing Sampling Locations and Locations of Identified Hazardous Building Materials  
March 24, 2016

### Appendix A FLOOR PLANS SHOWING SAMPLING LOCATIONS AND LOCATIONS OF IDENTIFIED HAZARDOUS BUILDING MATERIALS







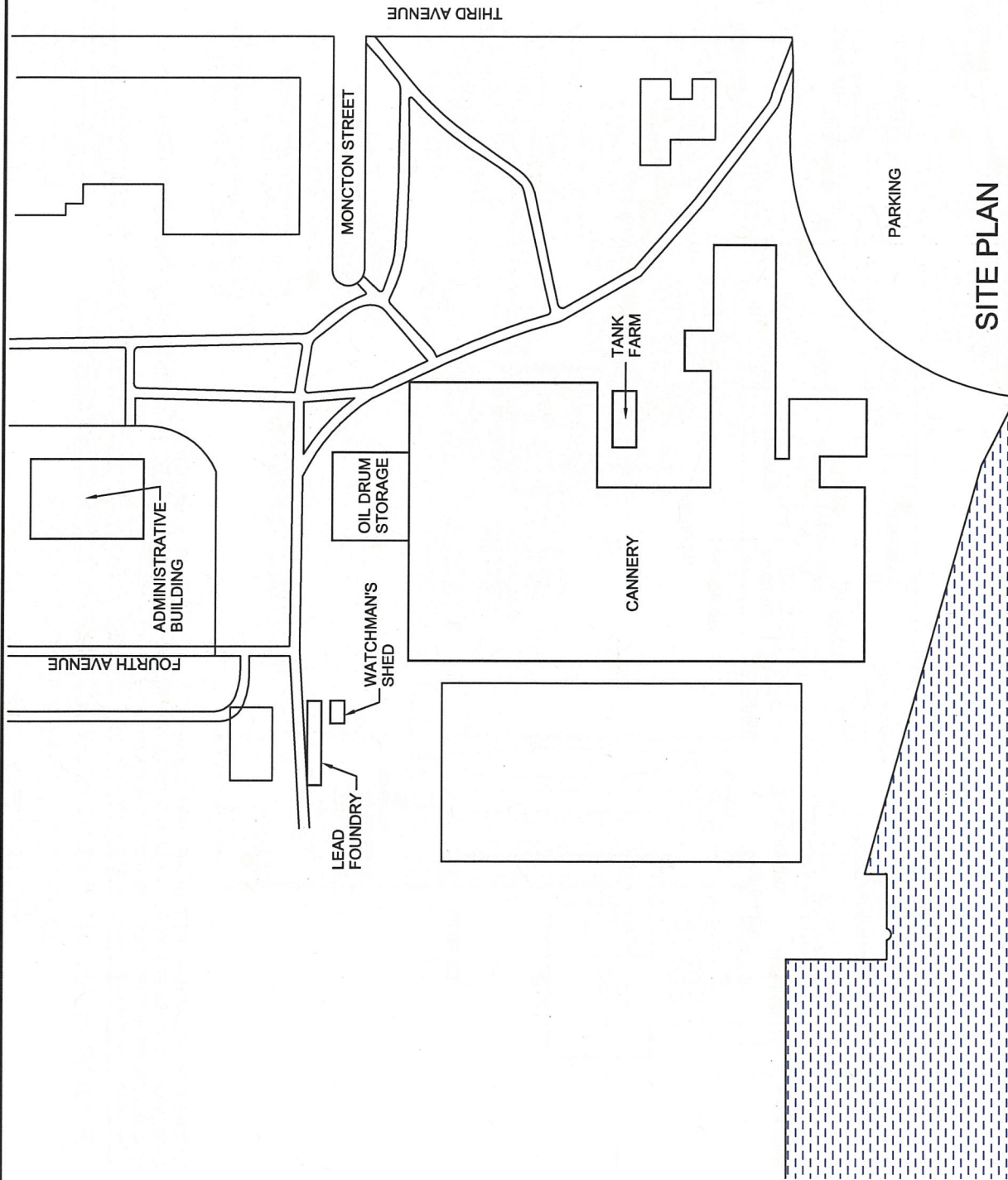
**LEGEND**

- FORT LANGLEY NATIONAL HISTORIC SITE
- GULF OF GEORGIA CANNERY
- FORT RODD HILL NATIONAL HISTORIC SITE
- GULF ISLANDS NATIONAL PARK
- PACIFIC RIM NATIONAL PARK

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

<b>SITE LOCATIONS</b>		<b>Project No.:</b> 123220330	<b>Dwg. No.:</b>
SOUTH COAST NATIONAL PARKS OF CANADA		Scale: N.T.S.	<b>A1</b>
SOUTH COAST OF BRITISH COLUMBIA		Date: 16/01/15	
PUBLIC WORKS AND GOVERNMENT SERVICES CANADA		Dwn. By: CD DM	
		App'd By: TW	





**SITE PLAN**

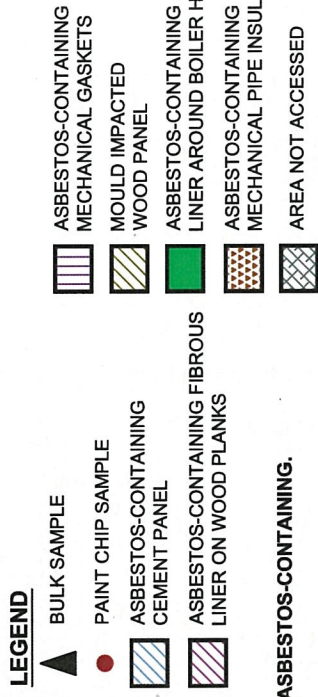
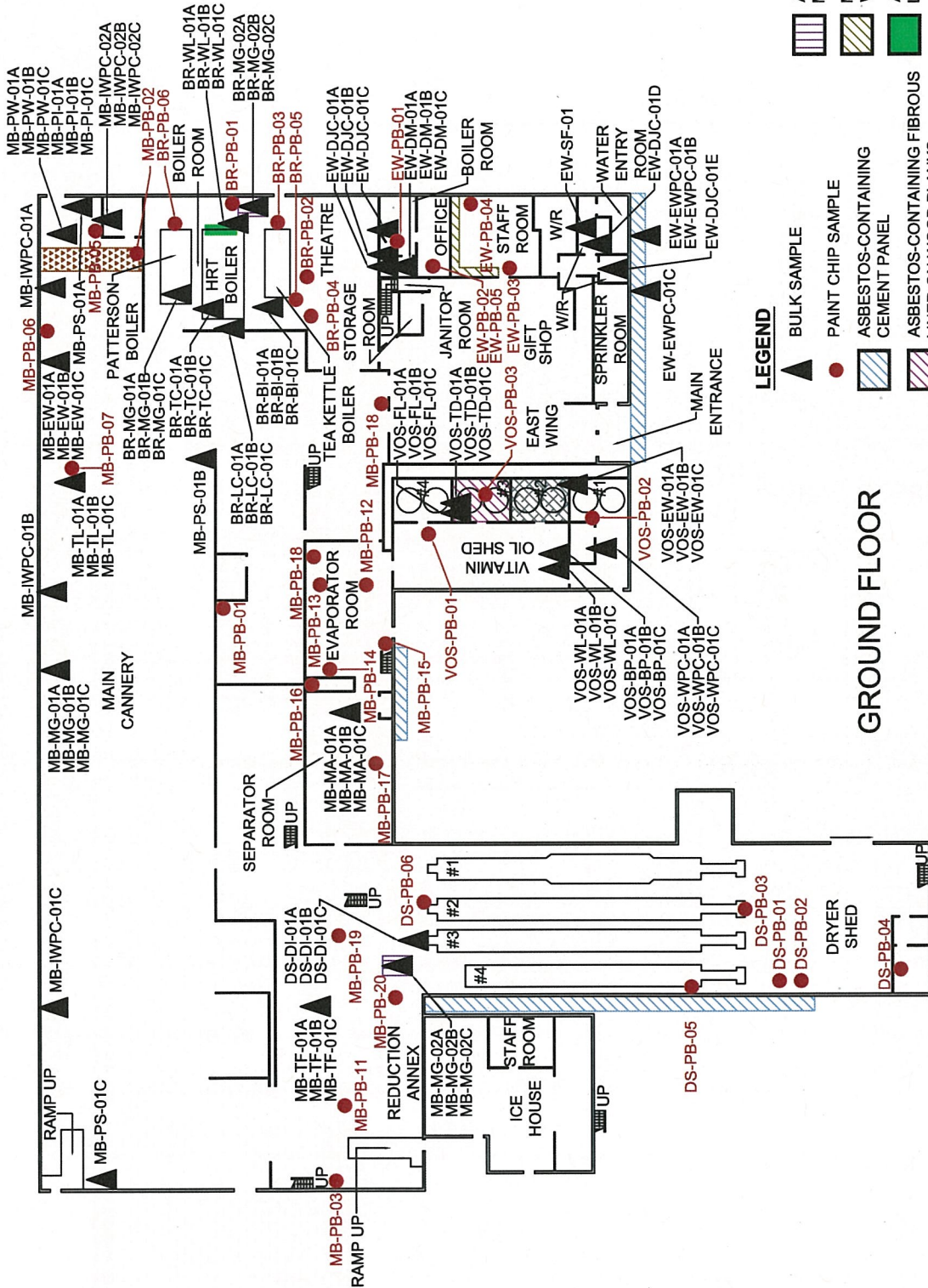
NOTE: THIS DRAWING ILLUSTRATES SUPPORTING INFORMATION SPECIFIC TO A STANTEC CONSULTING LTD. REPORT AND MUST NOT BE USED FOR OTHER PURPOSES.

<b>Project No.:</b> 123220330-300.100		<b>Dwg. No.:</b> A2	
<b>Scale:</b> N.T.S.			
<b>Date:</b> 16/02/16			
<b>Dwn. By:</b> CD PK/DM			
<b>App'd By:</b> TW			

**SITE PLAN SHOWING BUILDING LOCATIONS**

GULF OF GEORGIA CANNERY, RICHMOND, BC

PUBLIC WORKS AND GOVERNMENT SERVICES CANADA

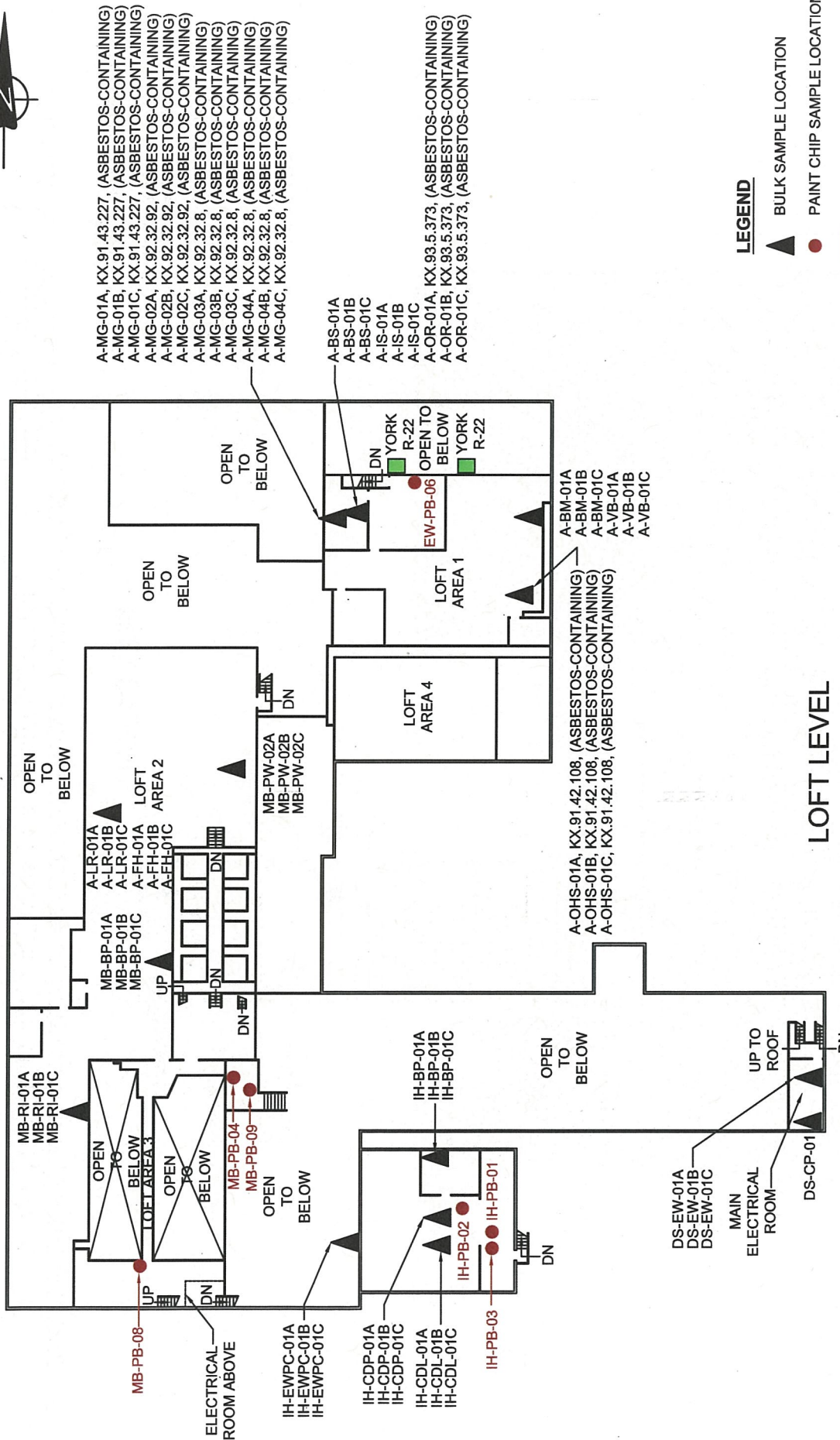


**GROUND FLOOR**

- NOTES:**
1. CEMENT PANEL BEHIND GE TRANSFORMER BOXES THROUGHOUT IS ASBESTOS-CONTAINING.
  2. MECHANICAL GASKETS ON FLANGES ATTACHED TO THE TWO LARGE TANKS IN THE TANK FARM ARE ASBESTOS-CONTAINING.
  3. BLUE SPRINKLER PIPE SEALANT THROUGHOUT IS ASBESTOS-CONTAINING.
  4. THIS DRAWING ILLUSTRATES SUPPORTING INFORMATION SPECIFIC TO A STANTEC CONSULTING LTD. REPORT AND MUST NOT BE USED FOR OTHER PURPOSES.

<p><b>FLOOR PLAN SHOWING HAZARDOUS BUILDING MATERIALS AND BULK SAMPLE LOCATIONS</b></p> <p>GULF OF GEORGIA CANNERY, RICHMOND, BC</p> <p>PUBLIC WORKS AND GOVERNMENT SERVICES CANADA</p>		<p>Project No.: 123220330-300.100</p> <p>Dwg. No.: <b>A3</b></p>	
		<p>Scale: N.T.S.</p> <p>Date: 16/02/18</p> <p>Dwn. By: CD PK/DMM</p> <p>App'd By: TW</p>	
<p>Client:</p>			





**NOTES:** 1. CEMENT PANEL BEHIND GE TRANSFORMER BOXES THROUGHOUT IS ASBESTOS-CONTAINING.  
 2. BLUE SPRINKLER PIPE SEALANT THROUGHOUT IS ASBESTOS-CONTAINING.  
 3. THIS DRAWING ILLUSTRATES SUPPORTING INFORMATION SPECIFIC TO A STANTEC CONSULTING LTD. REPORT AND MUST NOT BE USED FOR OTHER PURPOSES.

## FLOOR PLAN SHOWING HAZARDOUS BUILDING MATERIALS AND BULK SAMPLE LOCATIONS

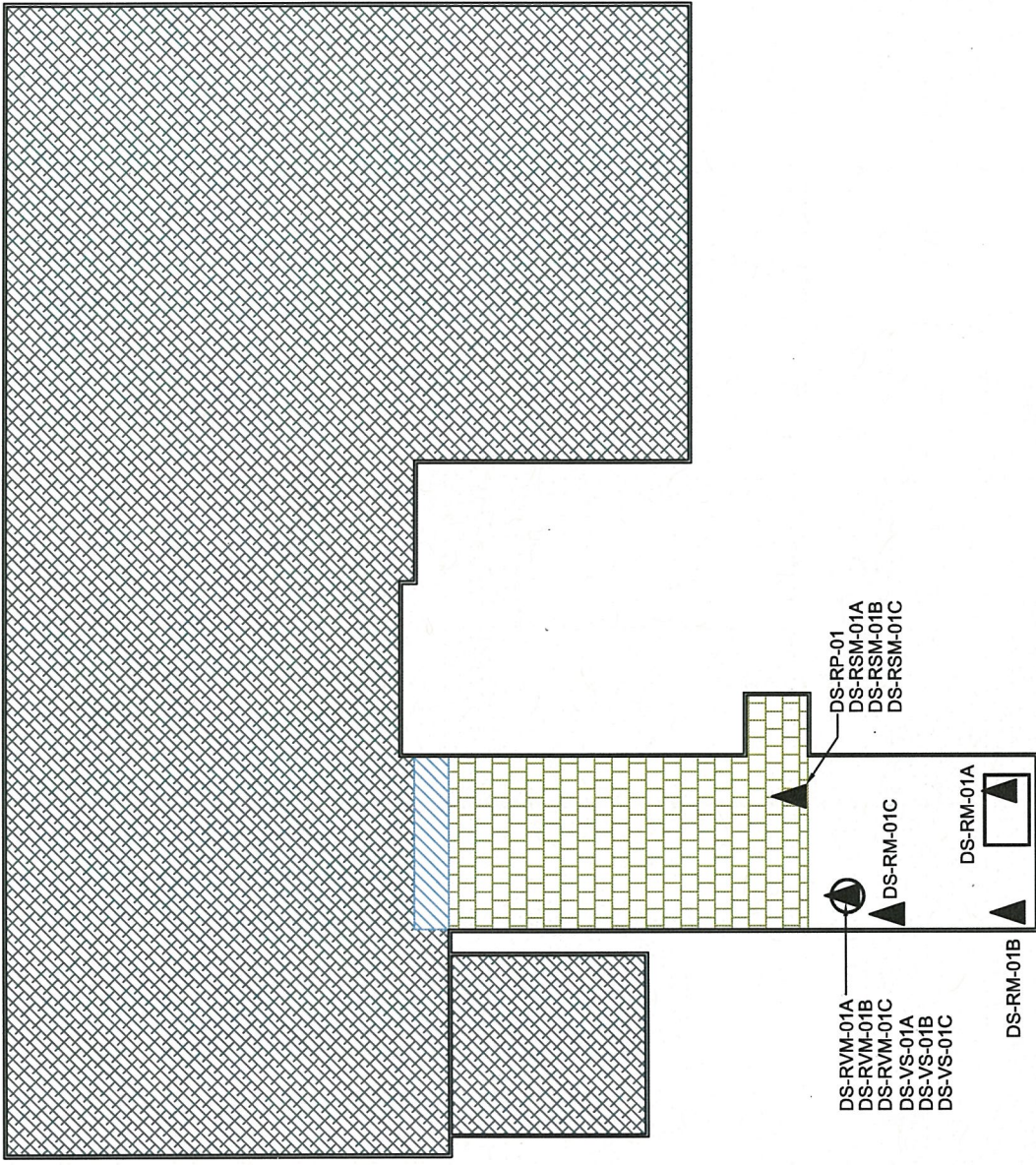
GULF OF GEORGIA CANNERY, RICHMOND, BC

PUBLIC WORKS AND GOVERNMENT SERVICES CANADA

Project No.:	123220330-300.100	Dwg. No.:	A4
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Date:	16/02/18		
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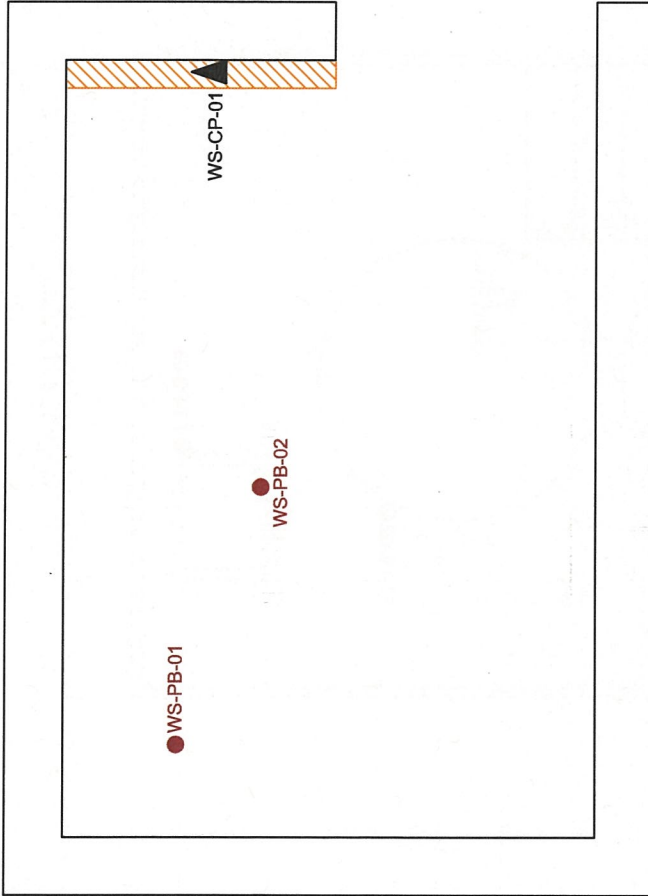
**LEGEND**

- BULK SAMPLE LOCATION
- ASBESTOS-CONTAINING CEMENT PANELLING
- ASBESTOS-CONTAINING ROOF PANELLING
- AREA NOT ACCESSED

**ROOF LEVEL**

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

<b>FLOOR PLAN SHOWING HAZARDOUS BUILDING MATERIALS AND BULK SAMPLE LOCATIONS</b>		<b>Project No.:</b> 123220330-300.100	<b>Dwg. No.:</b> A5
		<b>Scale:</b> N.T.S.	
		<b>Date:</b> 16/02/18	
		<b>Dwn. By:</b> CD VM/DM	SL2016020131
		<b>App'd By:</b> TW	
<b>Client:</b> PUBLIC WORKS AND GOVERNMENT SERVICES CANADA			



### WATCHMAN'S SHED

#### LEGEND



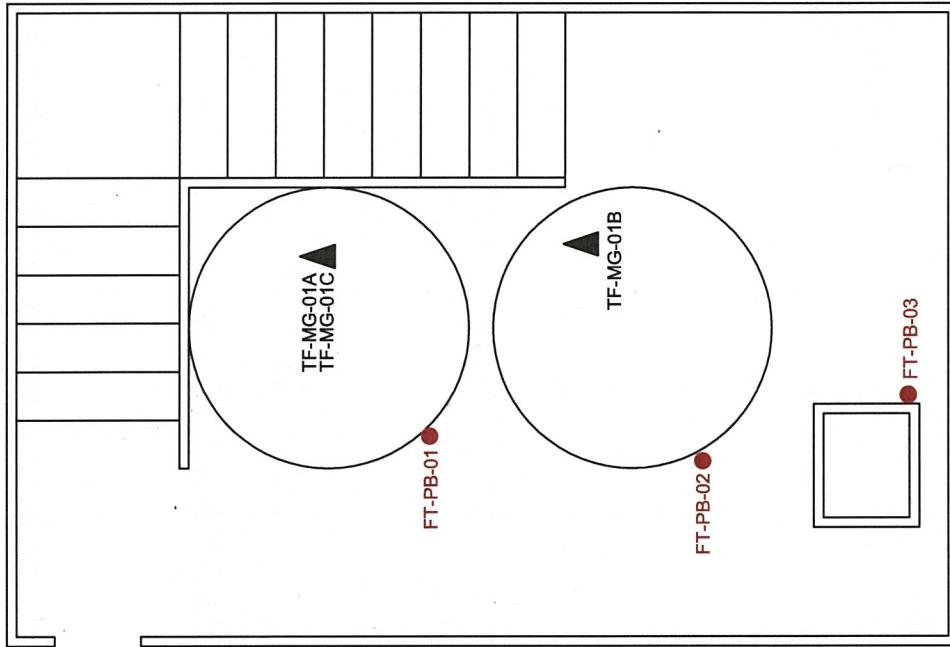
● PAINT CHIP SAMPLE



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

<b>FLOOR PLAN SHOWING HAZARDOUS BUILDING MATERIALS AND BULK SAMPLE LOCATIONS</b> GULF OF GEORGIA CANNERY, RICHMOND, BC PUBLIC WORKS AND GOVERNMENT SERVICES CANADA	<b>Project No.:</b> 123220330-300.100	<b>Dwg. No.:</b> A6	
	<b>Scale:</b> N.T.S.		
	<b>Date:</b> 16/02/18		
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<b>App'd By:</b> TW			





**LEGEND**

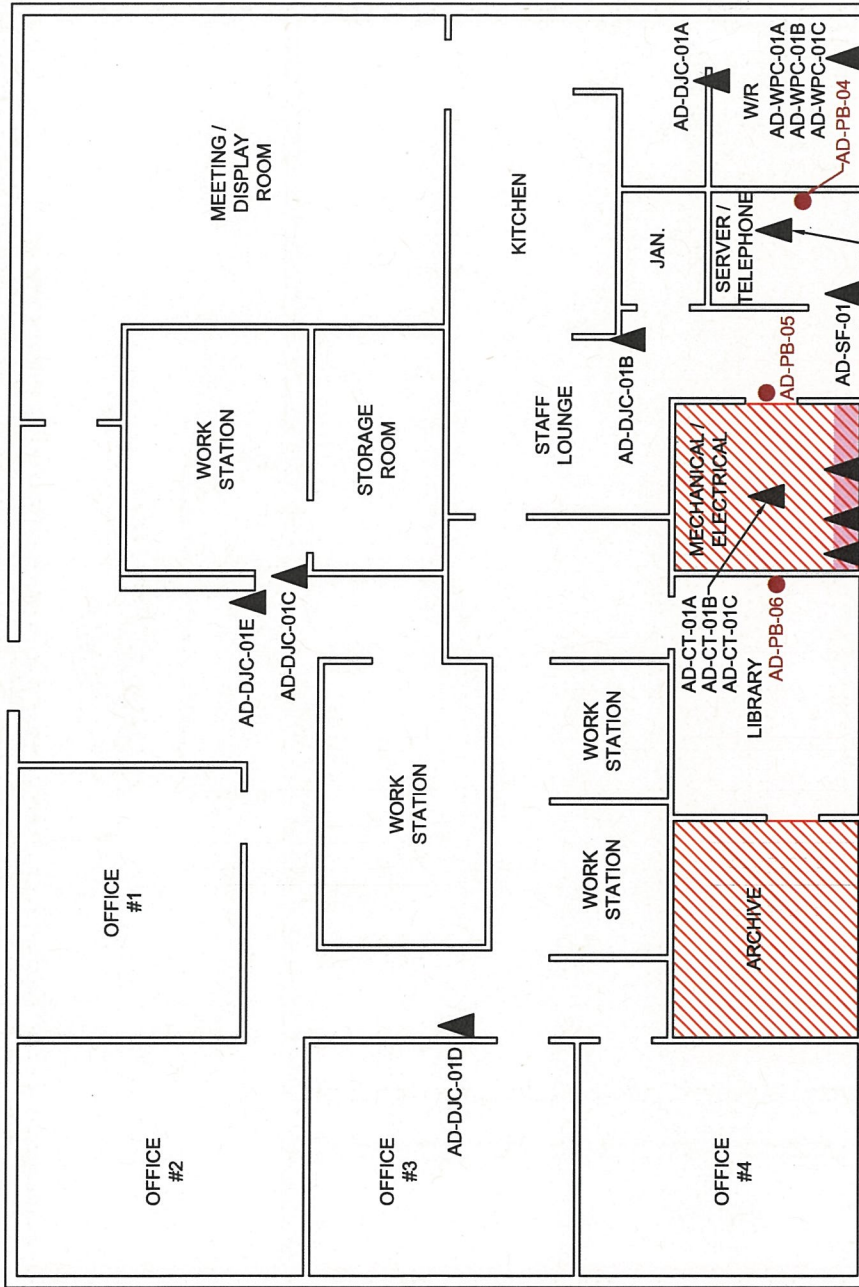
▲ BULK SAMPLE

● PAINT CHIP SAMPLE

**TANK FARM**

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

<b>Project No.:</b> 123220330-300.100		<b>Dwg. No.:</b>
<b>Scale:</b> N.T.S.		<b>A7</b>
<b>Date:</b> 16/02/18		
<b>Dwn. By:</b> CD PK/DM		
<b>App'd By:</b> TW		
<b>FLOOR PLAN SHOWING HAZARDOUS BUILDING MATERIALS AND BULK SAMPLE LOCATIONS</b> GULF OF GEORGIA CANNERY, RICHMOND, BC PUBLIC WORKS AND GOVERNMENT SERVICES CANADA		
<b>Client:</b>		



- LEGEND**
- ▲ BULK SAMPLE
  - PAINT CHIP SAMPLE
  - ▨ ASBESTOS-CONTAINING FLOOR TILE WITH SUSPECTED MASTIC
  - ASBESTOS-CONTAINING GREY ELECTRICAL PUTTY

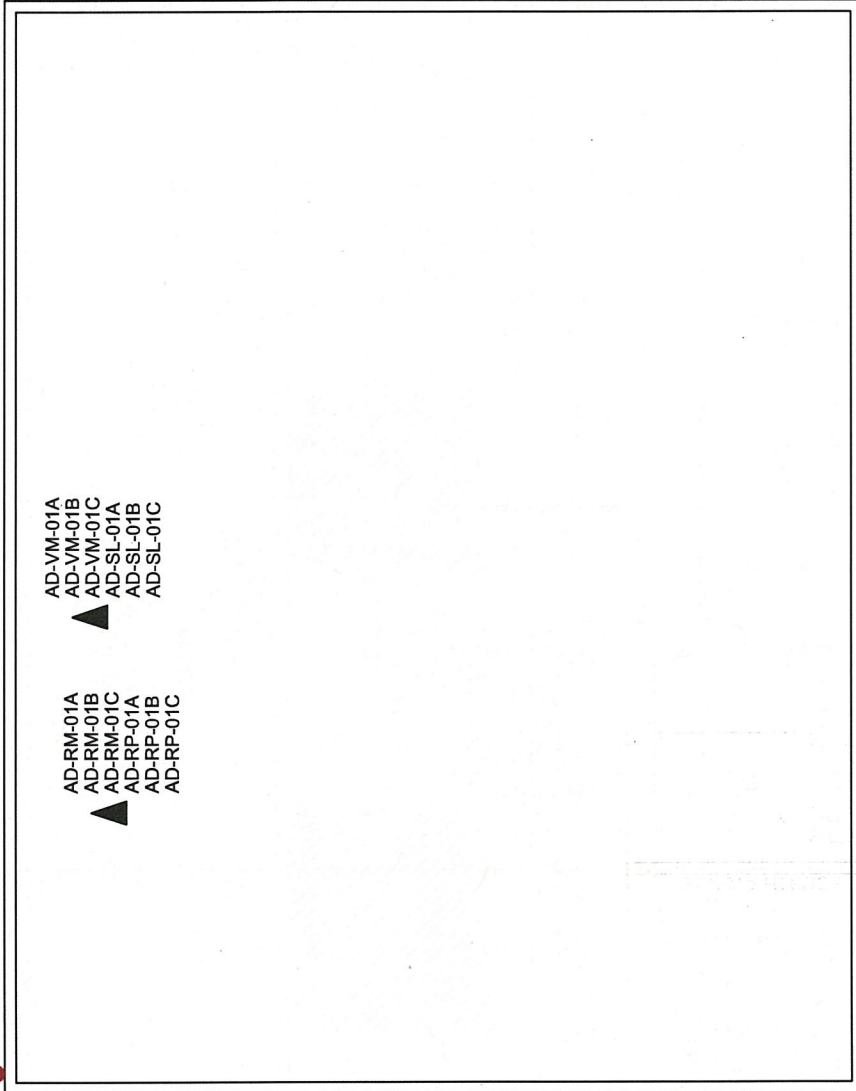
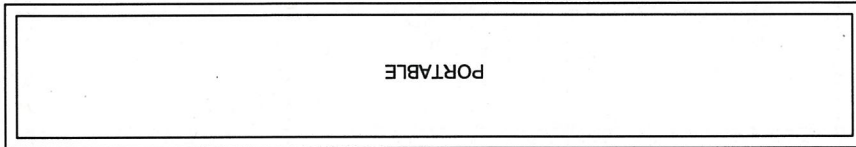
**ADMIN BUILDING**

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

<b>FLOOR PLAN SHOWING HAZARDOUS BUILDING MATERIALS AND BULK SAMPLE LOCATIONS</b> GULF OF GEORGIA CANNERY, RICHMOND, BC PUBLIC WORKS AND GOVERNMENT SERVICES CANADA		Project No.: 123220330-300.100 Scale: N.T.S. Date: 16/02/18 Dwn. By: CD PK/DM App'd By: TW	Dwg. No.: <b>A8</b>	
		Client:		



AD-PB-01  
AD-PB-02



AD-VM-01A  
AD-VM-01B  
AD-VM-01C  
AD-SL-01A  
AD-SL-01B  
AD-SL-01C

AD-RM-01A  
AD-RM-01B  
AD-RM-01C  
AD-RP-01A  
AD-RP-01B  
AD-RP-01C

**LEGEND**

▲ BULK SAMPLE

● PAINT CHIP SAMPLE

**ADMIN BUILDING  
ROOF**

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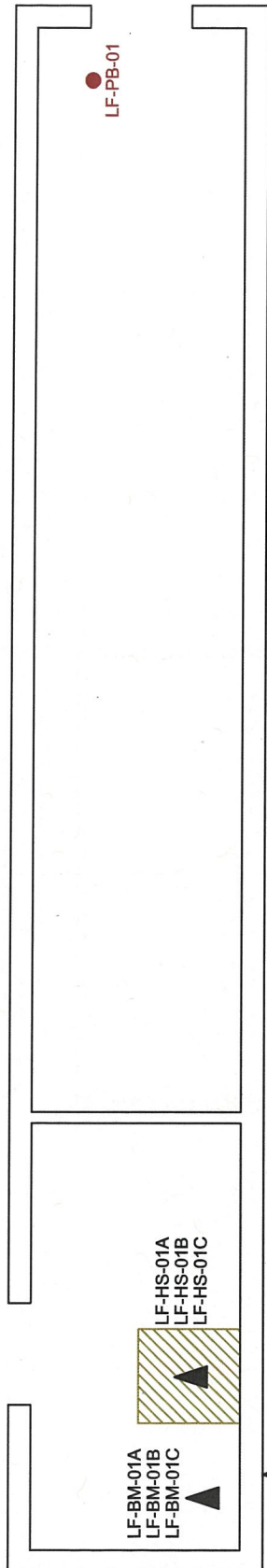
Project No.:	123220330-300.100	Dwg. No.:	A9
Scale:	N.T.S.		
Date:	16/02/18		
Dwn. By:	CD PK/DM		
App'd By:	TW		

**FLOOR PLAN SHOWING HAZARDOUS BUILDING MATERIALS  
AND BULK SAMPLE LOCATIONS**

GULF OF GEORGIA CANNERY, RICHMOND, BC

PUBLIC WORKS AND GOVERNMENT SERVICES CANADA





# LEAD FOUNDRY

## LEGEND

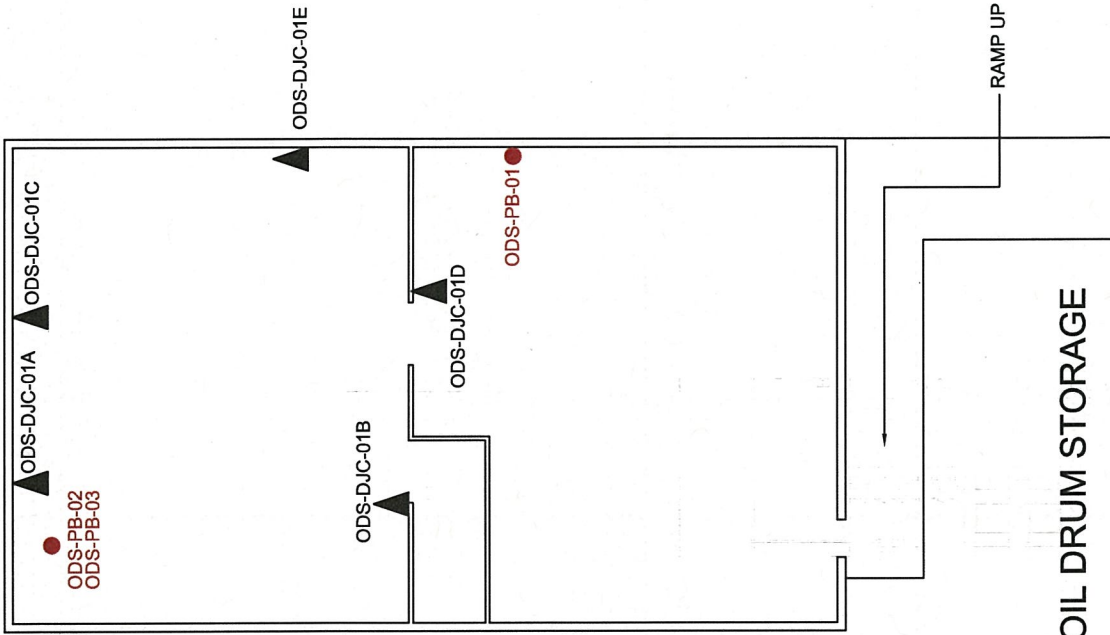
-  BULK SAMPLE
-  PAINT CHIP SAMPLE
-  ASBESTOS-CONTAINING HEAT SHIELD

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<b>Project No.:</b> 123220330-300.100		<b>Dwg. No.:</b>
<b>Scale:</b> N.T.S.	<b>A10</b>	
<b>Date:</b> 16/02/18		
<b>Dwn. By:</b> CD PK/DIM		
<b>App'd By:</b> TW		
<b>FLOOR PLAN SHOWING HAZARDOUS BUILDING MATERIALS AND BULK SAMPLE LOCATIONS</b>		
GULF OF GEORGIA CANNERY, RICHMOND, BC		
Client: PUBLIC WORKS AND GOVERNMENT SERVICES CANADA		







**LEGEND**  
 ▲ BULK SAMPLE  
 ● PAINT CHIP SAMPLE

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<b>Project No.:</b> 123220330-300.100		<b>Dwg. No.:</b> A11	
<b>Scale:</b> N.T.S.			
<b>Date:</b> 16/02/18			
<b>Dwn. By:</b> CD PK/DM			
<b>App'd By:</b> TW			
<b>FLOOR PLAN SHOWING HAZARDOUS BUILDING MATERIALS AND BULK SAMPLE LOCATIONS</b>			
GULF OF GEORGIA CANNERY, RICHMOND, BC			
PUBLIC WORKS AND GOVERNMENT SERVICES CANADA			
<b>Client:</b>			



# HAZARDOUS BUILDING MATERIALS ASSESSMENT

Appendix B Summary of Results of Analysis of Bulk Samples for Asbestos  
March 24, 2016

## Appendix B SUMMARY OF RESULTS OF ANALYSIS OF BULK SAMPLES FOR ASBESTOS







## HAZARDOUS BUILDING MATERIALS ASSESSMENT

Summary of Suspected ACM Bulk Samples  
February 19, 2016

**Table E-1 Cannery Building – Suspected ACM Sample Collection and Analysis Summary**

Sample Number	Material Description	Serial #	Results
<b>Cannery "Artifacts" (A)</b>			
A-MG-01A	Mechanical gasket	KX.91.43.227	25% Chrysotile
A-MG-01B	Mechanical gasket	KX.91.43.227	Stop Positive (Not Analyzed)
A-MG-01C	Mechanical gasket	KX.91.43.227	Stop Positive (Not Analyzed)
A-MG-02A	Mechanical gasket	KX.92.32.92	25% Chrysotile
A-MG-02B	Mechanical gasket	KX.92.32.92	Stop Positive (Not Analyzed)
A-MG-02C	Mechanical gasket	KX.92.32.92	Stop Positive (Not Analyzed)
A-MG-03A	Mechanical gasket	KX.92.32.8	40% Chrysotile
A-MG-03B	Mechanical gasket	KX.92.32.8	Stop Positive (Not Analyzed)
A-MG-03C	Mechanical gasket	KX.92.32.8	Stop Positive (Not Analyzed)
A-MG-04A	Mechanical gasket	KX.92.32.8	35.8% Chrysotile
A-MG-04B	Mechanical gasket	KX.92.32.8	Stop Positive (Not Analyzed)
A-MG-04C	Mechanical gasket	KX.92.32.8	Stop Positive (Not Analyzed)
A-VB-01A	White vinyl belt	n/a	None Detected
A-VB-01B	White vinyl belt	n/a	None Detected
A-VB-01C	White vinyl belt	n/a	None Detected
A-BM-01A	Black belt	KX.91.42.81	None Detected
A-BM-01B	Black belt	KX.91.42.81	None Detected
A-BM-01C	Black belt	KX.91.42.81	None Detected
A-BS-01A	Boat strip	KX.91.43.318	None Detected
A-BS-01B	Boat strip	KX.91.43.318	None Detected
A-BS-01C	Boat strip	KX.91.43.318	None Detected
A-OR-01A	'O' ring	KX.93.5.373	35.3% Chrysotile
A-OR-01B	'O' ring	KX.93.5.373	Stop Positive (Not Analyzed)
A-OR-01C	'O' ring	KX.93.5.373	Stop Positive (Not Analyzed)
A-IS-01A	Insulation strip	KX.91.43.330	None Detected



## HAZARDOUS BUILDING MATERIALS ASSESSMENT

Summary of Suspected ACM Bulk Samples  
February 19, 2016

**Table E-1 Cannery Building – Suspected ACM Sample Collection and Analysis Summary**

A-IS-01B	Insulation strip	KX.91.43.330	None Detected
A-IS-01C	Insulation strip	KX.91.43.330	None Detected
<b>A-OHS-01A</b>	<b>Oven heat shield</b>	<b>KX.91.42.108</b>	<b>7.4% Chrysotile</b>
<b>A-OHS-01B</b>	<b>Oven heat shield</b>	<b>KX.91.42.108</b>	<b>Stop Positive (Not Analyzed)</b>
<b>A-OHS-01C</b>	<b>Oven heat shield</b>	<b>KX.91.42.108</b>	<b>Stop Positive (Not Analyzed)</b>
A-LR-01A	Lead roll	n/a	None Detected
A-LR-01B	Lead roll	n/a	None Detected
A-LR-01C	Lead roll	n/a	None Detected
A-FH-01A	Fire hose	n/a	None Detected
A-FH-01B	Fire hose	n/a	None Detected
A-FH-01C	Fire hose	n/a	None Detected
<b>Dryer Shed/Grinding and Sacking Room (DS)</b>			
DS-DI-01A	White dryer insulation	Inside dryer #3	None Detected
DS-DI-01B	White dryer insulation	Inside dryer #3	None Detected
DS-DI-01C	White dryer insulation	Inside dryer #3	None Detected
DS-EW-01A	Grey electrical wrap	Upper Level – south wall of electrical room	None Detected
DS-EW-01B	Grey electrical wrap	Upper Level – south wall of electrical room	None Detected
DS-EW-01C	Grey electrical wrap	Upper Level – south wall of electrical room	None Detected
<b>DS-CP-01</b>	<b>Cement panel</b>	<b>Upper Level – West wall of electrical room behind transformer</b>	<b>15% Chrysotile</b>
DS-RVM-01A	Black roof vent mastic	Roof – base seams of vent	None Detected
DS-RVM-01B	Black roof vent mastic	Roof – base seams of vent	None Detected
DS-RVM-01C	Black roof vent mastic	Roof – base seams of vent	None Detected
<b>DS-RP-01</b>	<b>Grey roof panel</b>	<b>Roof – east side below walkway</b>	<b>18.3% Chrysotile</b>
DS-RSM-01A	Black roof structure mastic	Roof – below grey roof panel on wood structure	None Detected
DS-RSM-01B	Black roof structure mastic	Roof – below grey roof panel on wood structure	None Detected
DS-RSM-01C	Black roof structure mastic	Roof – below grey roof panel on wood structure	None Detected
DS-RM-01A	Black roof material	Roof of staircase	<0.25% Chrysotile
DS-RM-01B	Black roof material	Roof of staircase	None Detected



## HAZARDOUS BUILDING MATERIALS ASSESSMENT

Summary of Suspected ACM Bulk Samples  
February 19, 2016

**Table E-1 Cannery Building – Suspected ACM Sample Collection and Analysis Summary**

DS-RM-01C	Black roof material	Roof of staircase	<0.25% Chrysotile
DS-VS-01A	Grey roof vent sealant	Roof – edge of vent	None Detected
DS-VS-01B	Grey roof vent sealant	Roof – edge of vent	None Detected
DS-VS-01C	Grey roof vent sealant	Roof – edge of vent	<0.25% Chrysotile
<b>Vitamin Oil Shed (VOS)</b>			
VOS-BP-01A	Black building paper	North interior wall south of office	None Detected
VOS-BP-01B	Black building paper	North interior wall south of office	None Detected
VOS-BP-01C	Black building paper	North interior wall south of office	None Detected
VOS-WL-01A	Brown woven liner	Around edge of heavy duty door north of shed	None Detected
VOS-WL-01B	Brown woven liner	Around edge of heavy duty door north of shed	None Detected
VOS-WL-01C	Brown woven liner	Around edge of heavy duty door north of shed	None Detected
VOS-TD-01A	Black tank debris	Wood plank in tank room #3	None Detected
VOS-TD-01B	Black tank debris	Wood plank in tank room #3	None Detected
VOS-TD-01C	Black tank debris	Wood plank in tank room #3	None Detected
VOS-EW-01A	Brown electrical wrap	West wall of tank room #1	None Detected
VOS-EW-01B	Brown electrical wrap	West wall of tank room #1	None Detected
VOS-EW-01C	Brown electrical wrap	West wall of tank room #1	None Detected
VOS-WPC-01A	Grey window pane caulking	Exterior window between pane and frame of office	None Detected
VOS-WPC-01B	Grey window pane caulking	Exterior window between pane and frame of office	None Detected
VOS-WPC-01C	Grey window pane caulking	Exterior window between pane and frame of office	None Detected
<b>VOS-FL-01A</b>	<b>Tan fibrous liner</b>	<b>Wood plank in tank room #3</b>	<b>30% Chrysotile</b>
<b>VOS-FL-01B</b>	<b>Tan fibrous liner</b>	<b>Wood plank in tank room #3</b>	<b>Stop Positive (Not Analyzed)</b>
<b>VOS-FL-01C</b>	<b>Tan fibrous liner</b>	<b>Wood plank in tank room #3</b>	<b>Stop Positive (Not Analyzed)</b>
<b>Boiler Room (BR)</b>			
<b>BR-WL-01A</b>	<b>Tan woven liner</b>	<b>'HRT' boiler – perimeter of hatch</b>	<b>None Detected</b>
<b>BR-WL-01B</b>	<b>Tan woven liner</b>	<b>'HRT' boiler – perimeter of hatch</b>	<b>None Detected</b>
<b>BR-WL-01B – Tan Layer</b>	<b>Tan woven liner</b>	<b>'HRT' boiler – perimeter of hatch</b>	<b>30% Chrysotile</b>



## HAZARDOUS BUILDING MATERIALS ASSESSMENT

Summary of Suspected ACM Bulk Samples  
February 19, 2016

**Table E-1 Cannery Building – Suspected ACM Sample Collection and Analysis Summary**

BR-WL-01C	Tan woven liner	'HRT' boiler – perimeter of hatch	Stop Positive (Not Analyzed)
BR-TC-01A	White taping compound	'HRT' boiler - seams of ducting on ceiling	None Detected
BR-TC-01B	White taping compound	'HRT' boiler - seams of ducting on ceiling	None Detected
BR-TC-01C	White taping compound	'HRT' boiler - seams of ducting on ceiling	None Detected
BR-BI-01A	Brown boiler insulation	Tea Kettle boiler	<0.25% Chrysotile
BR-BI-01B	Brown boiler insulation	Tea Kettle boiler	None Detected
BR-BI-01C	Brown boiler insulation	Tea Kettle boiler	None Detected
BR-LC-01A	Leveling compound	'HRT' boiler – base	None Detected
BR-LC-01B	Leveling compound	'HRT' boiler – base	None Detected
BR-LC-01C	Leveling compound	'HRT' boiler – base	None Detected
BR-MG-01A	Brown mechanical gasket	Patterson boiler – stack opening	None Detected
BR-MG-01B	Brown mechanical gasket	Patterson boiler – stack opening	None Detected
BR-MG-01C	Brown mechanical gasket	Patterson boiler – stack opening	None Detected
<b>BR-MG-02A</b>	<b>Dark brown mechanical gasket</b>	<b>Small tank on north east side of the building on wall</b>	<b>42.3% Chrysotile</b>
<b>BR-MG-02B</b>	<b>Dark brown mechanical gasket</b>	<b>Small tank on north east side of the building on wall</b>	<b>Stop Positive (Not Analyzed)</b>
<b>BR-MG-02C</b>	<b>Dark brown mechanical gasket</b>	<b>Small tank on north east side of the building on wall</b>	<b>Stop Positive (Not Analyzed)</b>
<b>East Wing (EW)</b>			
EW-DJC-01A	Dry wall joint compound	West wall of mechanical room	None Detected
EW-DJC-01B	Dry wall joint compound	West wall of mechanical room	None Detected
EW-DJC-01C	Dry wall joint compound	West wall of mechanical room	None Detected
EW-DJC-01D	Dry wall joint compound	North wall of men's washroom	None Detected
EW-DJC-01E	Dry wall joint compound	East wall of handicap washroom	None Detected
EW-DM-01A	Grey duct mastic	Mechanical room	None Detected
EW-DM-01B	Grey duct mastic	Mechanical room	None Detected
EW-DM-01C	Grey duct mastic	Mechanical room	None Detected
EW-SF-01	Grey sheet flooring	Men's washroom	None Detected
EW-EWPC-01A	White exterior window pane caulking	North side of the building between pane and frame	None Detected



## HAZARDOUS BUILDING MATERIALS ASSESSMENT

Summary of Suspected ACM Bulk Samples  
February 19, 2016

**Table E-1 Cannery Building – Suspected ACM Sample Collection and Analysis Summary**

EW-EWPC-01B	White exterior window pane caulking	North side of the building between pane and frame	None Detected
EW-EWPC-01C	White exterior window pane caulking	North side of the building between pane and frame	None Detected
<b>Ice House (IH)</b>			
IH-CDP-01A	Brown cooler door paper	Upper level -- inside wood panel	None Detected
IH-CDP-01B	Brown cooler door paper	Upper level -- inside wood panel	None Detected
IH-CDP-01C	Brown cooler door paper	Upper level -- inside wood panel	None Detected
IH-CDL-01A	Brown cooler door liner	Upper level – perimeter of cooler door	None Detected
IH-CDL-01B	Brown cooler door liner	Upper level – perimeter of cooler door	None Detected
IH-CDL-01C	Brown cooler door liner	Upper level – perimeter of cooler door	None Detected
IH-BP-01A	Black building paper	Upper level – inside wood panels of cooler room	None Detected
IH-BP-01B	Black building paper	Upper level – inside wood panels of cooler room	None Detected
IH-BP-01C	Black building paper	Upper level – inside wood panels of cooler room	None Detected
IH-EWPC-01A	White exterior window pane caulking	West window of building between pane and frame	None Detected
IH-EWPC-01B	White exterior window pane caulking	West window of building between pane and frame	None Detected
IH-EWPC-01C	White exterior window pane caulking	West window of building between pane and frame	None Detected
<b>Main Building (MB)</b>			
<b>MB-PI-01A</b>	<b>White air cell insulation</b>	<b>Ceiling space in north east exit</b>	<b>40% Chrysotile</b>
<b>MB-PI-01B</b>	<b>White air cell insulation</b>	<b>Ceiling space in north east exit</b>	<b>Stop Positive (Not Analyzed)</b>
<b>MB-PI-01C</b>	<b>White air cell insulation</b>	<b>Ceiling space in north east exit</b>	<b>Stop Positive (Not Analyzed)</b>
MB-PW-01A	White woven air cell pipe wrap	Ceiling space in north east exit	None Detected
MB-PW-01B	White woven air cell pipe wrap	Ceiling space in north east exit	None Detected
MB-PW-01C	White woven air cell pipe wrap	Ceiling space in north east exit	None Detected
<b>MB-PS-01A</b>	<b>Blue sprinkler pipe sealant</b>	<b>Interior wall west of plant office</b>	<b>1.4% Chrysotile</b>
<b>MB-PS-01B</b>	<b>Blue sprinkler pipe sealant</b>	<b>East wall of evaporator adjacent to Vitamin Oil Shed</b>	<b>Stop Positive (Not Analyzed)</b>



## HAZARDOUS BUILDING MATERIALS ASSESSMENT

Summary of Suspected ACM Bulk Samples  
February 19, 2016

**Table E-1 Cannery Building – Suspected ACM Sample Collection and Analysis Summary**

<b>MB-PS-01C</b>	<b>Blue sprinkler pipe sealant</b>	<b>Interior wall by south west exit</b>	<b>Stop Positive (Not Analyzed)</b>
MB-MG-01A	Black mechanical gasket	Canning crew station	None Detected
MB-MG-01B	Black mechanical gasket	Canning crew station	None Detected
MB-MG-01C	Black mechanical gasket	Canning crew station	None Detected
MB-MA-01A	Black mastic	Yellow separator	None Detected
MB-MA-01B	Black mastic	Yellow separator	None Detected
MB-MA-01C	Black mastic	Yellow separator	None Detected
<b>MB-MG-02A</b>	<b>Silver mechanical gasket</b>	<b>Press in south east of the building</b>	<b>29.6% Chrysotile</b>
<b>MB-MG-02B</b>	<b>Silver mechanical gasket</b>	<b>Press in south east of the building</b>	<b>Stop Positive (Not Analyzed)</b>
<b>MB-MG-02C</b>	<b>Silver mechanical gasket</b>	<b>Press in south east of the building</b>	<b>Stop Positive (Not Analyzed)</b>
MB-IWPC-01A	White interior window pane caulking	North west corner of building between pane and window	None Detected
MB-IWPC-01B	White interior window pane caulking	west side of the building between pane and window	None Detected
MB-IWPC-01C	White interior window pane caulking	South west corner of the building between pane and window	None Detected
MB-IWPC-02A	Yellow interior window pane caulking	Exterior windows of plant office between pane and window by north east corner of building	None Detected
MB-IWPC-02B	Yellow interior window pane caulking	Exterior windows of plant office between pane and window by north east corner of building	None Detected
MB-IWPC-02C	Yellow interior window pane caulking	Exterior windows of plant office between pane and window by north east corner of building	None Detected
MB-RI-01A	Yellow remnant insulation	Mezzanine level – south of tank area around pipe	None Detected
MB-RI-01B	Yellow remnant insulation	Mezzanine level – south of tank area around pipe	None Detected
MB-RI-01C	Yellow remnant insulation	Mezzanine level – south of tank area around pipe	None Detected
MB-TL-01A	Brown woven tank liner	Canning boiler by caning crew station	None Detected
MB-TL-01B	Brown woven tank liner	Canning boiler by caning crew station	None Detected
MB-TL-01C	Brown woven tank liner	Canning boiler by caning crew station	None Detected

## HAZARDOUS BUILDING MATERIALS ASSESSMENT

Summary of Suspected ACM Bulk Samples  
February 19, 2016

**Table E-1 Cannery Building – Suspected ACM Sample Collection and Analysis Summary**

MB-BP-01A	Black roof paper	Mezzanine level – south west storage area under roof material	None Detected
MB-BP-01B	Black roof paper	Mezzanine level – south west storage area under roof material	None Detected
MB-BP-01C	Black roof paper	Mezzanine level – south west storage area under roof material	None Detected
MB-EW-01A	Black and tan woven electrical wrap	North west exit hanging from the ceiling	None Detected
MB-EW-01B	Black and tan woven electrical wrap	North west exit hanging from the ceiling	None Detected
MB-EW-01C	Black and tan woven electrical wrap	North west exit hanging from the ceiling	None Detected
MB-PW-02A	Black pipe wrap	Mezzanine level – between west tanks in tank area	None Detected
MB-PW-02A	Black pipe wrap	Mezzanine level – between west tanks in tank area	None Detected
MB-PW-02A	Black pipe wrap	Mezzanine level – between west tanks in tank area	None Detected
MB-TF-01A	Black textured floor	Reduction Annex	None Detected
MB-TF-01B	Black textured floor	Reduction Annex	None Detected
MB-TF-01C	Black textured floor	Reduction Annex	None Detected

**Table E-2 Watchman's Shed – Suspected ACM Sample Collection and Analysis Summary**

Sample Number	Material Description	Location	Results
WS-CP-01	Grey cement panel	Lower east wall of shed	20% Chrysotile

**Table E-3 Tank Farm – Suspected ACM Sample Collection and Analysis Summary**

Sample Number	Material Description	Location	Results
TF-MG-01A	Grey mechanical gasket	West tank	39.2% Chrysotile
TF-MG-01B	Grey mechanical gasket	East tank	Stop Positive (Not Analyzed)
TF-MG-01C	Grey mechanical gasket	West tank	Stop Positive (Not Analyzed)



## HAZARDOUS BUILDING MATERIALS ASSESSMENT

Summary of Suspected ACM Bulk Samples  
February 19, 2016

**Table E-4 Administrative Building – Suspected ACM Sample Collection and Analysis Summary**

Sample Number	Material Description	Location	Results
AD-DJC-01A	Dry wall joint compound	Interior wall of washroom	None Detected
AD-DJC-01B	Dry wall joint compound	North wall of staff lounge	None Detected
AD-DJC-01C	Dry wall joint compound	East wall of reception	None Detected
AD-DJC-01D	Dry wall joint compound	North wall of office #3	None Detected
AD-DJC-01E	Dry wall joint compound	North wall of reception	None Detected
AD-WPC-01A	Black window pane caulking	Window on east side of the washroom between pane and frame	None Detected
AD-WPC-01B	Black window pane caulking	Window on east side of the washroom between pane and frame	None Detected
AD-WPC-01C	Black window pane caulking	Window on east side of the washroom between pane and frame	None Detected
<b>AD-EPP-01A</b>	<b>Grey electrical penetration putty</b>	<b>Upper east wall of the mechanical room</b>	<b>12.3% Chrysotile</b>
<b>AD-EPP-01B</b>	<b>Grey electrical penetration putty</b>	<b>Upper east wall of the mechanical room</b>	<b>Stop Positive (Not Analyzed)</b>
<b>AD-EPP-01C</b>	<b>Grey electrical penetration putty</b>	<b>Upper east wall of the mechanical room</b>	<b>Stop Positive (Not Analyzed)</b>
AD-CT-01A	2'x4' standard fissure and pinhole ceiling tile	Mechanical room	None Detected
AD-CT-01B	2'x4' standard fissure and pinhole ceiling tile	Mechanical room	None Detected
AD-CT-01C	2'x4' standard fissure and pinhole ceiling tile	Mechanical room	None Detected
AD-CT-02A	1'x1' large and small pinhole ceiling tile	Server room	None Detected
AD-CT-02B	1'x1' large and small pinhole ceiling tile	Server room	None Detected
AD-CT-02C	1'x1' large and small pinhole ceiling tile	Server room	None Detected
<b>AD-FT-01</b>	<b>12"x12" pink stone pattern floor tile</b>	<b>Mechanical room</b>	<b>1.1% Chrysotile</b>
<b>AD-FT-01 mastic</b>	<b>Mastic on 12"x12" pink stone pattern floor tile</b>	<b>Mechanical room</b>	<b>2% Chrysotile</b>
AD-SF-01	White marble pattern sheet flooring	Server room	None Detected
AD-RP-01A	White penetration mastic	Roof – base of steel post holding wires	None Detected
AD-RP-01B	White penetration mastic	Roof – base of steel post holding wires	None Detected



## HAZARDOUS BUILDING MATERIALS ASSESSMENT

Summary of Suspected ACM Bulk Samples  
February 19, 2016

**Table E-4 Administrative Building – Suspected ACM Sample Collection and Analysis Summary**

AD-RP-01C	White penetration mastic	Roof – base of steel post holding wires	None Detected
AD-SL-01A	Black stack liner	Roof – base on ventilation stack	None Detected
AD-SL-01B	Black stack liner	Roof – base on ventilation stack	None Detected
AD-SL-01C	Black stack liner	Roof – base on ventilation stack	None Detected
AD-RM-01A	Black roof material	Floor of roof	None Detected
AD-RM-01B	Black roof material	Floor of roof	None Detected
AD-RM-01C	Black roof material	Floor of roof	None Detected
AD-VM-01A	Clear vent mastic	Roof – base on ventilation stack	None Detected
AD-VM-01B	Clear vent mastic	Roof – base on ventilation stack	None Detected
AD-VM-01C	Clear vent mastic	Roof – base on ventilation stack	None Detected
AD-CBM-01A	Brown cove base mastic	Mechanical room	None Detected
AD-CBM-01B	Brown cove base mastic	Mechanical room	None Detected
AD-CBM-01C	Brown cove base mastic	Mechanical room	None Detected

**Table E-5 Lead Foundry – Suspected ACM Sample Collection and Analysis Summary**

Sample Number	Material Description	Location	Results
LF-GM-01A	Black gutter mastic	South exterior side of the building	None Detected
LF-GM-01B	Black gutter mastic	South exterior side of the building	None Detected
LF-GM-01C	Black gutter mastic	South exterior side of the building	None Detected
LF-BM-01A	Brick mortar	Chimney area west side of the building	None Detected
LF-BM-01B	Brick mortar	Chimney area west side of the building	None Detected
LF-BM-01C	Brick mortar	Chimney area west side of the building	None Detected
LF-HS-01A	Grey heat shield	Hanging from wood column on west side of the building	30% Chrysotile
LF-HS-01B	Grey heat shield	Hanging from wood column on west side of the building	Stop Positive (Not Analyzed)
LF-HS-01C	Grey heat shield	Hanging from wood column on west side of the building	Stop Positive (Not Analyzed)

## HAZARDOUS BUILDING MATERIALS ASSESSMENT

Summary of Suspected ACM Bulk Samples  
February 19, 2016

**Table E-6 Oil Drum Storage – Suspected ACM Sample Collection and Analysis Summary**

<b>Sample Number</b>	<b>Material Description</b>	<b>Location</b>	<b>Results</b>
ODS-DJC-01A	Dry wall joint compound	West wall	None Detected
ODS-DJC-01B	Dry wall joint compound	West wall of bathroom	None Detected
ODS-DJC-01C	Dry wall joint compound	West wall	None Detected
ODS-DJC-01D	Dry wall joint compound	East interior wall	None Detected
ODS-DJC-01E	Dry wall joint compound	North wall	None Detected

## HAZARDOUS BUILDING MATERIALS ASSESSMENT

Appendix C Laboratory Analytical Report—Asbestos: Polarized Light Microscopy  
March 24, 2016

# Appendix C LABORATORY ANALYTICAL REPORT—ASBESTOS: POLARIZED LIGHT MICROSCOPY







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EMSL Canada Order 551507881  
Customer ID: 55JACQ30L  
Customer PO: 123220330.300  
Project ID:

**Attn:** Steve Chou  
Stantec Consulting, Ltd.  
500 - 4730 Kingsway  
Burnaby, BC V5H 0C6

**Phone:** (604) 412-3004  
**Fax:**  
**Collected:**  
**Received:** 07/22/2015  
**Analyzed:** 07/30/2015

**Proj:** GOG/123220330.300.100

## Test Report: Asbestos Analysis in Bulk Material for Occupational Health and Safety British Columbia Regulation 188/2011 via EPA 600/R-93/116 Method

**Client Sample ID:** A-MG-01A

**Lab Sample ID:** 551507881-0001

**Sample Description:** KX.91.43.227/Mechanical gasket

TEST	Analyzed Date	Color	Non-Asbestos		Asbestos	Comment
			Fibrous	Non-Fibrous		
PLM	07/28/2015	White	0%	75%	25% Chrysotile	⊘ limited sample submitted

**Client Sample ID:** A-MG-01B

**Lab Sample ID:** 551507881-0002

**Sample Description:** KX.91.43.227/Mechanical gasket

TEST	Analyzed Date	Color	Non-Asbestos		Asbestos	Comment
			Fibrous	Non-Fibrous		
PLM	07/28/2015					Stop Positive (Not Analyzed)

**Client Sample ID:** A-MG-01C

**Lab Sample ID:** 551507881-0003

**Sample Description:** KX.91.43.227/Mechanical gasket

TEST	Analyzed Date	Color	Non-Asbestos		Asbestos	Comment
			Fibrous	Non-Fibrous		
PLM	07/28/2015					Stop Positive (Not Analyzed)

**Client Sample ID:** A-MG-02A

**Lab Sample ID:** 551507881-0004

**Sample Description:** KX.92.32.92/Mechanical gasket

TEST	Analyzed Date	Color	Non-Asbestos		Asbestos	Comment
			Fibrous	Non-Fibrous		
PLM	07/28/2015	Blue	0%	75%	25% Chrysotile	⊘ limited sample submitted

**Client Sample ID:** A-MG-02B

**Lab Sample ID:** 551507881-0005

**Sample Description:** KX.92.32.92/Mechanical gasket

TEST	Analyzed Date	Color	Non-Asbestos		Asbestos	Comment
			Fibrous	Non-Fibrous		
PLM	07/28/2015					Stop Positive (Not Analyzed)

**Client Sample ID:** A-MG-02C

**Lab Sample ID:** 551507881-0006

**Sample Description:** KX.92.32.92/Mechanical gasket

TEST	Analyzed Date	Color	Non-Asbestos		Asbestos	Comment
			Fibrous	Non-Fibrous		
PLM	07/28/2015					Stop Positive (Not Analyzed)

**Client Sample ID:** A-MG-03A

**Lab Sample ID:** 551507881-0007

**Sample Description:** KX.92.32.8/Mechanical gasket

TEST	Analyzed Date	Color	Non-Asbestos		Asbestos	Comment
			Fibrous	Non-Fibrous		
PLM	07/28/2015	Brown	0%	60%	40% Chrysotile	⊘



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EMSL Canada Order 551507881  
Customer ID: 55JACQ30L  
Customer PO: 123220330.300  
Project ID:

## Test Report: Asbestos Analysis in Bulk Material for Occupational Health and Safety British Columbia Regulation 188/2011 via EPA 600/R-93/116 Method

**Client Sample ID:** A-MG-03B **Lab Sample ID:** 551507881-0008  
**Sample Description:** KX.92.32.8/Mechanical gasket

TEST	Analyzed Date	Color	Non-Asbestos		Asbestos	Comment
			Fibrous	Non-Fibrous		
PLM	07/28/2015					Stop Positive (Not Analyzed)

**Client Sample ID:** A-MG-03C **Lab Sample ID:** 551507881-0009  
**Sample Description:** KX.92.32.8/Mechanical gasket

TEST	Analyzed Date	Color	Non-Asbestos		Asbestos	Comment
			Fibrous	Non-Fibrous		
PLM	07/28/2015					Stop Positive (Not Analyzed)

**Client Sample ID:** A-MG-04A **Lab Sample ID:** 551507881-0010  
**Sample Description:** KX.92.32.8/Mechanical gasket

TEST	Analyzed Date	Color	Non-Asbestos		Asbestos	Comment
			Fibrous	Non-Fibrous		
PLM Grav. Reduction	07/29/2015	Gray	0.0%	64.2%	35.8% Chrysotile	

**Client Sample ID:** A-MG-04B **Lab Sample ID:** 551507881-0011  
**Sample Description:** KX.92.32.8/Mechanical gasket

TEST	Analyzed Date	Color	Non-Asbestos		Asbestos	Comment
			Fibrous	Non-Fibrous		
PLM Grav. Reduction	07/29/2015					Positive Stop (Not Analyzed)

**Client Sample ID:** A-MG-04C **Lab Sample ID:** 551507881-0012  
**Sample Description:** KX.92.32.8/Mechanical gasket

TEST	Analyzed Date	Color	Non-Asbestos		Asbestos	Comment
			Fibrous	Non-Fibrous		
PLM Grav. Reduction	07/29/2015					Positive Stop (Not Analyzed)

**Client Sample ID:** A-VB-01A **Lab Sample ID:** 551507881-0013  
**Sample Description:** n/a/White vinyl belt

TEST	Analyzed Date	Color	Non-Asbestos		Asbestos	Comment
			Fibrous	Non-Fibrous		
PLM Grav. Reduction	07/29/2015	Tan	0.0%	100%	None Detected	

**Client Sample ID:** A-VB-01B **Lab Sample ID:** 551507881-0014  
**Sample Description:** n/a/White vinyl belt

TEST	Analyzed Date	Color	Non-Asbestos		Asbestos	Comment
			Fibrous	Non-Fibrous		
PLM Grav. Reduction	07/29/2015	Tan	0.0%	100%	None Detected	

**Client Sample ID:** A-VB-01C **Lab Sample ID:** 551507881-0015  
**Sample Description:** n/a/White vinyl belt

TEST	Analyzed Date	Color	Non-Asbestos		Asbestos	Comment
			Fibrous	Non-Fibrous		
PLM Grav. Reduction	07/29/2015	Tan	0.0%	100%	None Detected	





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EMSL Canada Order 551507881  
Customer ID: 55JACQ30L  
Customer PO: 123220330.300  
Project ID:

## Test Report: Asbestos Analysis in Bulk Material for Occupational Health and Safety British Columbia Regulation 188/2011 via EPA 600/R-93/116 Method

**Client Sample ID:** A-BM-01A **Lab Sample ID:** 551507881-0016  
**Sample Description:** KX.91.42.81/Black belt

TEST	Analyzed Date	Color	Non-Asbestos		Asbestos	Comment
			Fibrous	Non-Fibrous		
PLM Grav. Reduction	07/29/2015	Black	0.0%	100%	None Detected	<input checked="" type="checkbox"/>

**Client Sample ID:** A-BM-01B **Lab Sample ID:** 551507881-0017  
**Sample Description:** KX.91.42.81/Black belt

TEST	Analyzed Date	Color	Non-Asbestos		Asbestos	Comment
			Fibrous	Non-Fibrous		
PLM Grav. Reduction	07/29/2015	Black	0.0%	100%	None Detected	<input checked="" type="checkbox"/>

**Client Sample ID:** A-BM-01C **Lab Sample ID:** 551507881-0018  
**Sample Description:** KX.91.42.81/Black belt

TEST	Analyzed Date	Color	Non-Asbestos		Asbestos	Comment
			Fibrous	Non-Fibrous		
PLM Grav. Reduction	07/29/2015	Black	0.0%	100%	None Detected	<input checked="" type="checkbox"/>

**Client Sample ID:** A-BS-01A **Lab Sample ID:** 551507881-0019  
**Sample Description:** KX.91.43.318/Boat strip

TEST	Analyzed Date	Color	Non-Asbestos		Asbestos	Comment
			Fibrous	Non-Fibrous		
PLM Grav. Reduction	07/29/2015	Various/Black	0.0%	100%	None Detected	<input checked="" type="checkbox"/>

**Client Sample ID:** A-BS-01B **Lab Sample ID:** 551507881-0020  
**Sample Description:** KX.91.43.318/Boat strip

TEST	Analyzed Date	Color	Non-Asbestos		Asbestos	Comment
			Fibrous	Non-Fibrous		
PLM Grav. Reduction	07/29/2015	Various/Black	0.0%	100%	None Detected	<input checked="" type="checkbox"/>

**Client Sample ID:** A-BS-01C **Lab Sample ID:** 551507881-0021  
**Sample Description:** KX.91.43.318/Boat strip

TEST	Analyzed Date	Color	Non-Asbestos		Asbestos	Comment
			Fibrous	Non-Fibrous		
PLM Grav. Reduction	07/29/2015	Various/Black	0.0%	100%	None Detected	<input checked="" type="checkbox"/>

**Client Sample ID:** A-OR-01A **Lab Sample ID:** 551507881-0022  
**Sample Description:** KX.93.5.373/O' ring

TEST	Analyzed Date	Color	Non-Asbestos		Asbestos	Comment
			Fibrous	Non-Fibrous		
PLM Grav. Reduction	07/29/2015	Tan	0.0%	64.7%	35.3% Chrysotile	<input type="checkbox"/>

**Client Sample ID:** A-OR-01B **Lab Sample ID:** 551507881-0023  
**Sample Description:** KX.93.5.373/O' ring

TEST	Analyzed Date	Color	Non-Asbestos		Asbestos	Comment
			Fibrous	Non-Fibrous		
PLM Grav. Reduction	07/29/2015				Positive Stop (Not Analyzed)	



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EMSL Canada Order 551507881  
Customer ID: 55JACQ30L  
Customer PO: 123220330.300  
Project ID:

## Test Report: Asbestos Analysis in Bulk Material for Occupational Health and Safety British Columbia Regulation 188/2011 via EPA 600/R-93/116 Method

Client Sample ID: A-OR-01C

Lab Sample ID: 551507881-0024

Sample Description: KX.93.5.373/O' ring

TEST	Analyzed Date	Color	Non-Asbestos		Asbestos	Comment
			Fibrous	Non-Fibrous		
PLM Grav. Reduction	07/29/2015				Positive Stop (Not Analyzed)	

Client Sample ID: A-IS-01A

Lab Sample ID: 551507881-0025

Sample Description: KX.91.43.330/Insulation strip

TEST	Analyzed Date	Color	Non-Asbestos		Asbestos	Comment
			Fibrous	Non-Fibrous		
PLM Grav. Reduction	07/29/2015	Black/Silver	0.0%	100%	None Detected	<input checked="" type="checkbox"/>

Client Sample ID: A-IS-01B

Lab Sample ID: 551507881-0026

Sample Description: KX.91.43.330/Insulation strip

TEST	Analyzed Date	Color	Non-Asbestos		Asbestos	Comment
			Fibrous	Non-Fibrous		
PLM Grav. Reduction	07/29/2015	Black/Silver	0.0%	100%	None Detected	<input checked="" type="checkbox"/>

Client Sample ID: A-IS-01C

Lab Sample ID: 551507881-0027

Sample Description: KX.91.43.330/Insulation strip

TEST	Analyzed Date	Color	Non-Asbestos		Asbestos	Comment
			Fibrous	Non-Fibrous		
PLM Grav. Reduction	07/29/2015	Black/Silver	0.0%	100%	None Detected	<input checked="" type="checkbox"/>

Client Sample ID: A-OHS-01A

Lab Sample ID: 551507881-0028

Sample Description: KX.91.42.108/Oven heat shield

TEST	Analyzed Date	Color	Non-Asbestos		Asbestos	Comment
			Fibrous	Non-Fibrous		
PLM Grav. Reduction	07/29/2015	Brown/Tan	0.0%	92.6%	7.4% Chrysotile	<input type="checkbox"/>

Client Sample ID: A-OHS-01B

Lab Sample ID: 551507881-0029

Sample Description: KX.91.42.108/Oven heat shield

TEST	Analyzed Date	Color	Non-Asbestos		Asbestos	Comment
			Fibrous	Non-Fibrous		
PLM Grav. Reduction	07/29/2015				Positive Stop (Not Analyzed)	

Client Sample ID: A-OHS-01C

Lab Sample ID: 551507881-0030

Sample Description: KX.91.42.108/Oven heat shield

TEST	Analyzed Date	Color	Non-Asbestos		Asbestos	Comment
			Fibrous	Non-Fibrous		
PLM Grav. Reduction	07/29/2015				Positive Stop (Not Analyzed)	

Client Sample ID: A-LR-01A

Lab Sample ID: 551507881-0031

Sample Description: n/a/Lead roll

TEST	Analyzed Date	Color	Non-Asbestos		Asbestos	Comment
			Fibrous	Non-Fibrous		
PLM	07/28/2015	Brown	90%	10%	None Detected	<input checked="" type="checkbox"/>





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EMSL Canada Order 551507881  
Customer ID: 55JACQ30L  
Customer PO: 123220330.300  
Project ID:

## Test Report: Asbestos Analysis in Bulk Material for Occupational Health and Safety British Columbia Regulation 188/2011 via EPA 600/R-93/116 Method

**Client Sample ID:** A-LR-01B **Lab Sample ID:** 551507881-0032  
**Sample Description:** n/a/Lead roll

TEST	Analyzed Date	Color	Non-Asbestos		Asbestos	Comment
			Fibrous	Non-Fibrous		
PLM	07/28/2015	Brown	90%	10%	None Detected	<input checked="" type="checkbox"/>

**Client Sample ID:** A-LR-01C **Lab Sample ID:** 551507881-0033  
**Sample Description:** n/a/Lead roll

TEST	Analyzed Date	Color	Non-Asbestos		Asbestos	Comment
			Fibrous	Non-Fibrous		
PLM	07/29/2015	Tan	90%	10%	None Detected	<input checked="" type="checkbox"/>

**Client Sample ID:** A-FH-01A **Lab Sample ID:** 551507881-0034  
**Sample Description:** n/a/Fire hose

TEST	Analyzed Date	Color	Non-Asbestos		Asbestos	Comment
			Fibrous	Non-Fibrous		
PLM	07/28/2015	White	90%	10%	None Detected	<input checked="" type="checkbox"/>

**Client Sample ID:** A-FH-01B **Lab Sample ID:** 551507881-0035  
**Sample Description:** n/a/Fire hose

TEST	Analyzed Date	Color	Non-Asbestos		Asbestos	Comment
			Fibrous	Non-Fibrous		
PLM	07/28/2015	White	90%	10%	None Detected	<input checked="" type="checkbox"/>

**Client Sample ID:** A-FH-01C **Lab Sample ID:** 551507881-0036  
**Sample Description:** n/a/Fire hose

TEST	Analyzed Date	Color	Non-Asbestos		Asbestos	Comment
			Fibrous	Non-Fibrous		
PLM	07/29/2015	Gray/White	90%	10%	None Detected	<input checked="" type="checkbox"/>

**Client Sample ID:** DS-DI-01A **Lab Sample ID:** 551507881-0037  
**Sample Description:** White dryer insulation/White dryer insulation

TEST	Analyzed Date	Color	Non-Asbestos		Asbestos	Comment
			Fibrous	Non-Fibrous		
PLM	07/28/2015	White/Beige	0%	100%	None Detected	<input checked="" type="checkbox"/>

**Client Sample ID:** DS-DI-01B **Lab Sample ID:** 551507881-0038  
**Sample Description:** White dryer insulation/White dryer insulation

TEST	Analyzed Date	Color	Non-Asbestos		Asbestos	Comment
			Fibrous	Non-Fibrous		
PLM	07/28/2015	White	0%	100%	None Detected	<input checked="" type="checkbox"/>

**Client Sample ID:** DS-DI-01C **Lab Sample ID:** 551507881-0039  
**Sample Description:** White dryer insulation/White dryer insulation

TEST	Analyzed Date	Color	Non-Asbestos		Asbestos	Comment
			Fibrous	Non-Fibrous		
PLM	07/29/2015	White	0%	100%	None Detected	<input checked="" type="checkbox"/>



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EMSL Canada Order 551507881  
Customer ID: 55JACQ30L  
Customer PO: 123220330.300  
Project ID:

## Test Report: Asbestos Analysis in Bulk Material for Occupational Health and Safety British Columbia Regulation 188/2011 via EPA 600/R-93/116 Method

Client Sample ID: DS-EW-01A

Lab Sample ID: 551507881-0040

Sample Description: Grey electrical wrap/Grey electrical wrap

TEST	Analyzed Date	Color	Non-Asbestos		Asbestos	Comment
			Fibrous	Non-Fibrous		
PLM Grav. Reduction	07/29/2015	Black	0.0%	100%	None Detected	<input checked="" type="checkbox"/>

Client Sample ID: DS-EW-01B

Lab Sample ID: 551507881-0041

Sample Description: Grey electrical wrap/Grey electrical wrap

TEST	Analyzed Date	Color	Non-Asbestos		Asbestos	Comment
			Fibrous	Non-Fibrous		
PLM Grav. Reduction	07/29/2015	Black	0.0%	100%	None Detected	<input checked="" type="checkbox"/>

Client Sample ID: DS-EW-01C

Lab Sample ID: 551507881-0042

Sample Description: Grey electrical wrap/Grey electrical wrap

TEST	Analyzed Date	Color	Non-Asbestos		Asbestos	Comment
			Fibrous	Non-Fibrous		
PLM Grav. Reduction	07/29/2015	Black	0.0%	100%	None Detected	<input checked="" type="checkbox"/>

Client Sample ID: DS-CP-01

Lab Sample ID: 551507881-0043

Sample Description: Cement Panel/Cement Panel

TEST	Analyzed Date	Color	Non-Asbestos		Asbestos	Comment
			Fibrous	Non-Fibrous		
PLM	07/28/2015	Gray	0%	85%	15% Chrysotile	<input type="checkbox"/>

Client Sample ID: DS-RVM-01A

Lab Sample ID: 551507881-0044

Sample Description: Black roof vent mastic/Black roof vent mastic

TEST	Analyzed Date	Color	Non-Asbestos		Asbestos	Comment
			Fibrous	Non-Fibrous		
PLM Grav. Reduction	07/29/2015	Black	0.0%	100%	None Detected	<input checked="" type="checkbox"/>

Client Sample ID: DS-RVM-01B

Lab Sample ID: 551507881-0045

Sample Description: Black roof vent mastic/Black roof vent mastic

TEST	Analyzed Date	Color	Non-Asbestos		Asbestos	Comment
			Fibrous	Non-Fibrous		
PLM Grav. Reduction	07/29/2015	Black	0.0%	100%	None Detected	<input checked="" type="checkbox"/>

Client Sample ID: DS-RVM-01C

Lab Sample ID: 551507881-0046

Sample Description: Black roof vent mastic/Black roof vent mastic

TEST	Analyzed Date	Color	Non-Asbestos		Asbestos	Comment
			Fibrous	Non-Fibrous		
PLM Grav. Reduction	07/29/2015	Black	0.0%	100%	None Detected	<input checked="" type="checkbox"/>

Client Sample ID: DS-RP-01

Lab Sample ID: 551507881-0047

Sample Description: Grey roof panel/Grey roof panel

TEST	Analyzed Date	Color	Non-Asbestos		Asbestos	Comment
			Fibrous	Non-Fibrous		
PLM Grav. Reduction	07/29/2015	White/Green	0.0%	81.7%	18.3% Chrysotile	<input type="checkbox"/>





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EMSL Canada Order 551507881  
Customer ID: 55JACQ30L  
Customer PO: 123220330.300  
Project ID:

## Test Report: Asbestos Analysis in Bulk Material for Occupational Health and Safety British Columbia Regulation 188/2011 via EPA 600/R-93/116 Method

**Client Sample ID:** DS-RSM-01A **Lab Sample ID:** 551507881-0048  
**Sample Description:** Black roof structure mastic/Black roof structure mastic

TEST	Analyzed Date	Color	Non-Asbestos		Asbestos	Comment
			Fibrous	Non-Fibrous		
PLM Grav. Reduction	07/29/2015	Black	0.0%	100%	None Detected	<input checked="" type="checkbox"/>

**Client Sample ID:** DS-RSM-01B **Lab Sample ID:** 551507881-0049  
**Sample Description:** Black roof structure mastic/Black roof structure mastic

TEST	Analyzed Date	Color	Non-Asbestos		Asbestos	Comment
			Fibrous	Non-Fibrous		
PLM Grav. Reduction	07/29/2015	Black	0.0%	100%	None Detected	<input checked="" type="checkbox"/>

**Client Sample ID:** DS-RSM-01C **Lab Sample ID:** 551507881-0050  
**Sample Description:** Black roof structure mastic/Black roof structure mastic

TEST	Analyzed Date	Color	Non-Asbestos		Asbestos	Comment
			Fibrous	Non-Fibrous		
PLM Grav. Reduction	07/29/2015	Black	0.0%	100%	None Detected	<input checked="" type="checkbox"/>

**Client Sample ID:** DS-RM-01A **Lab Sample ID:** 551507881-0051  
**Sample Description:** Black roof material/Black roof material

TEST	Analyzed Date	Color	Non-Asbestos		Asbestos	Comment
			Fibrous	Non-Fibrous		
PLM Grav. Reduction	07/29/2015	Black	0.0%	100%	<0.25% Chrysotile	

**Client Sample ID:** DS-RM-01B **Lab Sample ID:** 551507881-0052  
**Sample Description:** Black roof material/Black roof material

TEST	Analyzed Date	Color	Non-Asbestos		Asbestos	Comment
			Fibrous	Non-Fibrous		
PLM Grav. Reduction	07/29/2015	Black	0.0%	100%	None Detected	<input checked="" type="checkbox"/>

**Client Sample ID:** DS-RM-01C **Lab Sample ID:** 551507881-0053  
**Sample Description:** Black roof material/Black roof material

TEST	Analyzed Date	Color	Non-Asbestos		Asbestos	Comment
			Fibrous	Non-Fibrous		
PLM Grav. Reduction	07/29/2015	Black	0.0%	100%	<0.25% Chrysotile	

**Client Sample ID:** DS-VS-01A **Lab Sample ID:** 551507881-0054  
**Sample Description:** Grey roof vent sealant/Grey roof vent sealant

TEST	Analyzed Date	Color	Non-Asbestos		Asbestos	Comment
			Fibrous	Non-Fibrous		
PLM Grav. Reduction	07/29/2015	Gray	0.0%	100%	None Detected	<input checked="" type="checkbox"/>

**Client Sample ID:** DS-VS-01B **Lab Sample ID:** 551507881-0055  
**Sample Description:** Grey roof vent sealant/Grey roof vent sealant

TEST	Analyzed Date	Color	Non-Asbestos		Asbestos	Comment
			Fibrous	Non-Fibrous		
PLM Grav. Reduction	07/29/2015	Gray	0.0%	100%	None Detected	<input checked="" type="checkbox"/>



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EMSL Canada Order 551507881  
Customer ID: 55JACQ30L  
Customer PO: 123220330.300  
Project ID:

## Test Report: Asbestos Analysis in Bulk Material for Occupational Health and Safety British Columbia Regulation 188/2011 via EPA 600/R-93/116 Method

**Client Sample ID:** DS-VS-01C **Lab Sample ID:** 551507881-0056

**Sample Description:** Grey roof vent sealant/Grey roof vent sealant

TEST	Analyzed Date	Color	Non-Asbestos		Asbestos	Comment
			Fibrous	Non-Fibrous		
PLM Grav. Reduction	07/29/2015	Gray	0.0%	100%	<0.25% Chrysotile	

**Client Sample ID:** VOS-BP-01A **Lab Sample ID:** 551507881-0057

**Sample Description:** North interior wall south of office/Black building paper

TEST	Analyzed Date	Color	Non-Asbestos		Asbestos	Comment
			Fibrous	Non-Fibrous		
PLM Grav. Reduction	07/29/2015	Black	0.0%	100%	None Detected	

**Client Sample ID:** VOS-BP-01B **Lab Sample ID:** 551507881-0058

**Sample Description:** North interior wall south of office/Black building paper

TEST	Analyzed Date	Color	Non-Asbestos		Asbestos	Comment
			Fibrous	Non-Fibrous		
PLM Grav. Reduction	07/29/2015	Black	0.0%	100%	None Detected	

**Client Sample ID:** VOS-BP-01C **Lab Sample ID:** 551507881-0059

**Sample Description:** North interior wall south of office/Black building paper

TEST	Analyzed Date	Color	Non-Asbestos		Asbestos	Comment
			Fibrous	Non-Fibrous		
PLM Grav. Reduction	07/29/2015	Black	0.0%	100%	None Detected	

**Client Sample ID:** VOS-WL-01A **Lab Sample ID:** 551507881-0060

**Sample Description:** Around edge of heavy duty door north of shed/Brown woven liner

TEST	Analyzed Date	Color	Non-Asbestos		Asbestos	Comment
			Fibrous	Non-Fibrous		
PLM	07/29/2015	Gray/White	90%	10%	None Detected	

**Client Sample ID:** VOS-WL-01B **Lab Sample ID:** 551507881-0061

**Sample Description:** Around edge of heavy duty door north of shed/Brown woven liner

TEST	Analyzed Date	Color	Non-Asbestos		Asbestos	Comment
			Fibrous	Non-Fibrous		
PLM	07/29/2015	Gray/White	90%	10%	None Detected	

**Client Sample ID:** VOS-WL-01C **Lab Sample ID:** 551507881-0062

**Sample Description:** Around edge of heavy duty door north of shed/Brown woven liner

TEST	Analyzed Date	Color	Non-Asbestos		Asbestos	Comment
			Fibrous	Non-Fibrous		
PLM	07/29/2015	Gray	90%	10%	None Detected	

**Client Sample ID:** VOS-TD-01A **Lab Sample ID:** 551507881-0063

**Sample Description:** Wood plank in tank room #3/Black tank debris

TEST	Analyzed Date	Color	Non-Asbestos		Asbestos	Comment
			Fibrous	Non-Fibrous		
PLM	07/29/2015	Brown/Black	0%	100%	None Detected	





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EMSL Canada Order 551507881  
Customer ID: 55JACQ30L  
Customer PO: 123220330.300  
Project ID:

## Test Report: Asbestos Analysis in Bulk Material for Occupational Health and Safety British Columbia Regulation 188/2011 via EPA 600/R-93/116 Method

Client Sample ID: VOS-TD-01B Lab Sample ID: 551507881-0064

Sample Description: Wood plank in tank room #3/Black tank debris

TEST	Analyzed Date	Color	Non-Asbestos		Asbestos	Comment
			Fibrous	Non-Fibrous		
PLM	07/29/2015	Brown/Black	0%	100%	None Detected	<input checked="" type="checkbox"/>

Client Sample ID: VOS-TD-01C Lab Sample ID: 551507881-0065

Sample Description: Wood plank in tank room #3/Black tank debris

TEST	Analyzed Date	Color	Non-Asbestos		Asbestos	Comment
			Fibrous	Non-Fibrous		
PLM	07/29/2015	Brown/Black	0%	100%	None Detected	<input checked="" type="checkbox"/>

Client Sample ID: VOS-EW-01A Lab Sample ID: 551507881-0066

Sample Description: West wall of tank room #1/Brown electrical wrap

TEST	Analyzed Date	Color	Non-Asbestos		Asbestos	Comment
			Fibrous	Non-Fibrous		
PLM Grav. Reduction	07/29/2015	Brown/Tan	0.0%	100%	None Detected	<input checked="" type="checkbox"/>

Client Sample ID: VOS-EW-01B Lab Sample ID: 551507881-0067

Sample Description: West wall of tank room #1/Brown electrical wrap

TEST	Analyzed Date	Color	Non-Asbestos		Asbestos	Comment
			Fibrous	Non-Fibrous		
PLM Grav. Reduction	07/29/2015	Brown/Tan	0.0%	100%	None Detected	<input checked="" type="checkbox"/>

Client Sample ID: VOS-EW-01C Lab Sample ID: 551507881-0068

Sample Description: West wall of tank room #1/Brown electrical wrap

TEST	Analyzed Date	Color	Non-Asbestos		Asbestos	Comment
			Fibrous	Non-Fibrous		
PLM Grav. Reduction	07/29/2015	Brown/Tan	0.0%	100%	None Detected	<input checked="" type="checkbox"/>

Client Sample ID: VOS-WPC-01A Lab Sample ID: 551507881-0069

Sample Description: Exterior window between pane & frame of office/Grey window pane caulking

TEST	Analyzed Date	Color	Non-Asbestos		Asbestos	Comment
			Fibrous	Non-Fibrous		
PLM	07/29/2015	Gray	0%	100%	None Detected	<input checked="" type="checkbox"/>

Client Sample ID: VOS-WPC-01B Lab Sample ID: 551507881-0070

Sample Description: Exterior window between pane & frame of office/Grey window pane caulking

TEST	Analyzed Date	Color	Non-Asbestos		Asbestos	Comment
			Fibrous	Non-Fibrous		
PLM	07/29/2015	Gray	0%	100%	None Detected	<input checked="" type="checkbox"/>

Client Sample ID: VOS-WPC-01C Lab Sample ID: 551507881-0071

Sample Description: Exterior window between pane & frame of office/Grey window pane caulking

TEST	Analyzed Date	Color	Non-Asbestos		Asbestos	Comment
			Fibrous	Non-Fibrous		
PLM	07/29/2015	White	0%	100%	None Detected	<input checked="" type="checkbox"/>



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Project ID:

## Test Report: Asbestos Analysis in Bulk Material for Occupational Health and Safety British Columbia Regulation 188/2011 via EPA 600/R-93/116 Method

**Client Sample ID:** VOS-FL-01A **Lab Sample ID:** 551507881-0072

**Sample Description:** Wood plank in tank room #3/Tan fibrous liner

TEST	Analyzed Date	Color	Non-Asbestos		Asbestos	Comment
			Fibrous	Non-Fibrous		
PLM	07/29/2015	Tan	50%	20%	30% Chrysotile	

**Client Sample ID:** VOS-FL-01B **Lab Sample ID:** 551507881-0073

**Sample Description:** Wood plank in tank room #3/Tan fibrous liner

TEST	Analyzed Date	Color	Non-Asbestos		Asbestos	Comment
			Fibrous	Non-Fibrous		
PLM	07/29/2015				Stop Positive (Not Analyzed)	

**Client Sample ID:** VOS-FL-01C **Lab Sample ID:** 551507881-0074

**Sample Description:** Wood plank in tank room #3/Tan fibrous liner

TEST	Analyzed Date	Color	Non-Asbestos		Asbestos	Comment
			Fibrous	Non-Fibrous		
PLM	07/29/2015				Stop Positive (Not Analyzed)	

**Client Sample ID:** BR-WL-01A **Lab Sample ID:** 551507881-0080

**Sample Description:** 'HRT' boiler – perimeter of hatch /Black woven liner

TEST	Analyzed Date	Color	Non-Asbestos		Asbestos	Comment
			Fibrous	Non-Fibrous		
PLM	07/29/2015	Brown/Black	0%	100%	None Detected	

**Client Sample ID:** BR-WL-01B **Lab Sample ID:** 551507881-0081

**Sample Description:** 'HRT' boiler – perimeter of hatch/Black woven liner

TEST	Analyzed Date	Color	Non-Asbestos		Asbestos	Comment
			Fibrous	Non-Fibrous		
PLM	07/29/2015	Brown/Black	0%	100%	None Detected	

**Client Sample ID:** BR-WL-01B-Tan layer **Lab Sample ID:** 551507881-0081A

**Sample Description:** 'HRT' boiler – perimeter of hatch/Black woven liner

TEST	Analyzed Date	Color	Non-Asbestos		Asbestos	Comment
			Fibrous	Non-Fibrous		
PLM	07/29/2015	Tan	0%	70%	30% Chrysotile	

**Client Sample ID:** BR-WL-01C **Lab Sample ID:** 551507881-0082

**Sample Description:** 'HRT' boiler – perimeter of hatch/Black woven liner

TEST	Analyzed Date	Color	Non-Asbestos		Asbestos	Comment
			Fibrous	Non-Fibrous		
PLM	07/29/2015				Stop Positive (Not Analyzed)	

**Client Sample ID:** BR-TC-01A **Lab Sample ID:** 551507881-0083

**Sample Description:** 'HRT' boiler - seams of ducting on ceiling/White taping compound

TEST	Analyzed Date	Color	Non-Asbestos		Asbestos	Comment
			Fibrous	Non-Fibrous		
PLM	07/29/2015	White	0%	100%	None Detected	





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Customer ID: 55JACQ30L  
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## Test Report: Asbestos Analysis in Bulk Material for Occupational Health and Safety British Columbia Regulation 188/2011 via EPA 600/R-93/116 Method

**Client Sample ID:** BR-TC-01B **Lab Sample ID:** 551507881-0084

**Sample Description:** 'HRT' boiler - seams of ducting on ceiling/White taping compound

TEST	Analyzed Date	Color	Non-Asbestos		Asbestos	Comment
			Fibrous	Non-Fibrous		
PLM	07/29/2015	White	0%	100%	None Detected	<input checked="" type="checkbox"/>

**Client Sample ID:** BR-TC-01C **Lab Sample ID:** 551507881-0085

**Sample Description:** 'HRT' boiler - seams of ducting on ceiling/White taping compound

TEST	Analyzed Date	Color	Non-Asbestos		Asbestos	Comment
			Fibrous	Non-Fibrous		
PLM	07/29/2015	White	0%	100%	None Detected	<input checked="" type="checkbox"/>

**Client Sample ID:** BR-BI-01A **Lab Sample ID:** 551507881-0086

**Sample Description:** Tea Kettle boiler /Brown boiler insulation

TEST	Analyzed Date	Color	Non-Asbestos		Asbestos	Comment
			Fibrous	Non-Fibrous		
400 PLM Pt Ct	07/29/2015	Brown	0%	100%	<0.25% Chrysotile	

**Client Sample ID:** BR-BI-01B **Lab Sample ID:** 551507881-0087

**Sample Description:** Tea Kettle boiler/Brown boiler insulation

TEST	Analyzed Date	Color	Non-Asbestos		Asbestos	Comment
			Fibrous	Non-Fibrous		
PLM	07/29/2015	Brown	0%	100%	None Detected	<input checked="" type="checkbox"/>

**Client Sample ID:** BR-BI-01C **Lab Sample ID:** 551507881-0088

**Sample Description:** Tea Kettle boiler/Brown boiler insulation

TEST	Analyzed Date	Color	Non-Asbestos		Asbestos	Comment
			Fibrous	Non-Fibrous		
PLM	07/29/2015	Brown/Black	0%	100%	None Detected	<input checked="" type="checkbox"/>

**Client Sample ID:** BR-LC-01A **Lab Sample ID:** 551507881-0089

**Sample Description:** 'HRT' boiler- base/Leveling compound

TEST	Analyzed Date	Color	Non-Asbestos		Asbestos	Comment
			Fibrous	Non-Fibrous		
PLM	07/29/2015	Brown	0%	100%	None Detected	<input checked="" type="checkbox"/>

**Client Sample ID:** BR-LC-01B **Lab Sample ID:** 551507881-0090

**Sample Description:** 'HRT' boiler- base/Leveling compound

TEST	Analyzed Date	Color	Non-Asbestos		Asbestos	Comment
			Fibrous	Non-Fibrous		
PLM	07/29/2015	Brown	0%	100%	None Detected	<input checked="" type="checkbox"/>

**Client Sample ID:** BR-LC-01C **Lab Sample ID:** 551507881-0091

**Sample Description:** 'HRT' boiler- base/Leveling compound

TEST	Analyzed Date	Color	Non-Asbestos		Asbestos	Comment
			Fibrous	Non-Fibrous		
PLM	07/29/2015	Gray/Black	0%	100%	None Detected	<input checked="" type="checkbox"/>



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Project ID:

## Test Report: Asbestos Analysis in Bulk Material for Occupational Health and Safety British Columbia Regulation 188/2011 via EPA 600/R-93/116 Method

**Client Sample ID:** BR-MG-01A **Lab Sample ID:** 551507881-0092  
**Sample Description:** Patterson boiler- stack opening/Brown mechanical gasket

TEST	Analyzed Date	Color	Non-Asbestos		Asbestos	Comment
			Fibrous	Non-Fibrous		
PLM Grav. Reduction	07/29/2015	Brown	0.0%	100%	None Detected	<input checked="" type="checkbox"/>

**Client Sample ID:** BR-MG-01B **Lab Sample ID:** 551507881-0093  
**Sample Description:** Patterson boiler- stack opening/Brown mechanical gasket

TEST	Analyzed Date	Color	Non-Asbestos		Asbestos	Comment
			Fibrous	Non-Fibrous		
PLM Grav. Reduction	07/29/2015	Brown	0.0%	100%	None Detected	<input checked="" type="checkbox"/>

**Client Sample ID:** BR-MG-01C **Lab Sample ID:** 551507881-0094  
**Sample Description:** Patterson boiler- stack opening/Brown mechanical gasket

TEST	Analyzed Date	Color	Non-Asbestos		Asbestos	Comment
			Fibrous	Non-Fibrous		
PLM Grav. Reduction	07/29/2015	Brown	0.0%	100%	None Detected	<input checked="" type="checkbox"/>

**Client Sample ID:** BR-MG-02A **Lab Sample ID:** 551507881-0095  
**Sample Description:** Small tank on north east side of the bldg on wall/Dark brown mechanical gasket

TEST	Analyzed Date	Color	Non-Asbestos		Asbestos	Comment
			Fibrous	Non-Fibrous		
PLM Grav. Reduction	07/29/2015	Brown	0.0%	57.7%	42.3% Chrysotile	<input type="checkbox"/>

**Client Sample ID:** BR-MG-02B **Lab Sample ID:** 551507881-0096  
**Sample Description:** Small tank on north east side of the bldg on wall/Dark brown mechanical gasket

TEST	Analyzed Date	Color	Non-Asbestos		Asbestos	Comment
			Fibrous	Non-Fibrous		
PLM Grav. Reduction	07/29/2015				Positive Stop (Not Analyzed)	

**Client Sample ID:** BR-MG-02C **Lab Sample ID:** 551507881-0097  
**Sample Description:** Small tank on north east side of the bldg on wall/Dark brown mechanical gasket

TEST	Analyzed Date	Color	Non-Asbestos		Asbestos	Comment
			Fibrous	Non-Fibrous		
PLM Grav. Reduction	07/29/2015				Positive Stop (Not Analyzed)	

**Client Sample ID:** EW-DJC-01A **Lab Sample ID:** 551507881-0132  
**Sample Description:** West wall of mechanical room/Dry wall joint compound

TEST	Analyzed Date	Color	Non-Asbestos		Asbestos	Comment
			Fibrous	Non-Fibrous		
PLM	07/29/2015	White	0%	100%	None Detected	<input checked="" type="checkbox"/>

**Client Sample ID:** EW-DJC-01B **Lab Sample ID:** 551507881-0133  
**Sample Description:** West wall of mechanical room/Dry wall joint compound

TEST	Analyzed Date	Color	Non-Asbestos		Asbestos	Comment
			Fibrous	Non-Fibrous		
PLM	07/29/2015	White	0%	100%	None Detected	<input checked="" type="checkbox"/>





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## Test Report: Asbestos Analysis in Bulk Material for Occupational Health and Safety British Columbia Regulation 188/2011 via EPA 600/R-93/116 Method

Client Sample ID: EW-DJC-01C

Lab Sample ID: 551507881-0134

Sample Description: West wall of mechanical room/Dry wall joint compound

TEST	Analyzed Date	Color	Non-Asbestos		Asbestos	Comment
			Fibrous	Non-Fibrous		
PLM	07/29/2015	White	0%	100%	None Detected	<input checked="" type="checkbox"/>

Client Sample ID: EW-DJC-01D

Lab Sample ID: 551507881-0135

Sample Description: North wall of men's washroom/Dry wall joint compound

TEST	Analyzed Date	Color	Non-Asbestos		Asbestos	Comment
			Fibrous	Non-Fibrous		
PLM	07/29/2015	White	0%	100%	None Detected	<input checked="" type="checkbox"/>

Client Sample ID: EW-DJC-01E

Lab Sample ID: 551507881-0136

Sample Description: East wall of handicap washroom/Dry wall joint compound

TEST	Analyzed Date	Color	Non-Asbestos		Asbestos	Comment
			Fibrous	Non-Fibrous		
PLM	07/29/2015	White	0%	100%	None Detected	<input checked="" type="checkbox"/>

Client Sample ID: EW-DM-01A

Lab Sample ID: 551507881-0137

Sample Description: Mechanical room/Grey duct mastic

TEST	Analyzed Date	Color	Non-Asbestos		Asbestos	Comment
			Fibrous	Non-Fibrous		
PLM Grav. Reduction	07/29/2015	Gray	0.0%	100%	None Detected	<input checked="" type="checkbox"/>

Client Sample ID: EW-DM-01B

Lab Sample ID: 551507881-0138

Sample Description: Mechanical room/Grey duct mastic

TEST	Analyzed Date	Color	Non-Asbestos		Asbestos	Comment
			Fibrous	Non-Fibrous		
PLM Grav. Reduction	07/29/2015	Gray	0.0%	100%	None Detected	<input checked="" type="checkbox"/>

Client Sample ID: EW-DM-01C

Lab Sample ID: 551507881-0139

Sample Description: Mechanical room/Grey duct mastic

TEST	Analyzed Date	Color	Non-Asbestos		Asbestos	Comment
			Fibrous	Non-Fibrous		
PLM Grav. Reduction	07/29/2015	Gray	0.0%	100%	None Detected	<input checked="" type="checkbox"/>

Client Sample ID: EW-SF-01

Lab Sample ID: 551507881-0140

Sample Description: Men's washroom/Grey sheet flooring

TEST	Analyzed Date	Color	Non-Asbestos		Asbestos	Comment
			Fibrous	Non-Fibrous		
PLM Grav. Reduction	07/29/2015	Gray	0.0%	100%	None Detected	<input checked="" type="checkbox"/>

Client Sample ID: EW-EWPC-01A

Lab Sample ID: 551507881-0141

Sample Description: North side of the bldg between pane & frame/White exterior window pane caulking

TEST	Analyzed Date	Color	Non-Asbestos		Asbestos	Comment
			Fibrous	Non-Fibrous		
PLM Grav. Reduction	07/29/2015	White	0.0%	100%	None Detected	<input checked="" type="checkbox"/>



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## Test Report: Asbestos Analysis in Bulk Material for Occupational Health and Safety British Columbia Regulation 188/2011 via EPA 600/R-93/116 Method

**Client Sample ID:** EW-EWPC-01B **Lab Sample ID:** 551507881-0142  
**Sample Description:** North side of the bldg between pane & frame/White exterior window pane caulking

TEST	Analyzed Date	Color	Non-Asbestos		Asbestos	Comment
			Fibrous	Non-Fibrous		
PLM Grav. Reduction	07/29/2015	White	0.0%	100%	None Detected	<input checked="" type="checkbox"/>

**Client Sample ID:** EW-EWPC-01C **Lab Sample ID:** 551507881-0143  
**Sample Description:** North side of the bldg between pane & frame/White exterior window pane caulking

TEST	Analyzed Date	Color	Non-Asbestos		Asbestos	Comment
			Fibrous	Non-Fibrous		
PLM Grav. Reduction	07/29/2015	White	0.0%	100%	None Detected	<input checked="" type="checkbox"/>

**Client Sample ID:** IH-CDP-01A **Lab Sample ID:** 551507881-0153  
**Sample Description:** Upper level -- inside wood panel /Brown cooler door paper

TEST	Analyzed Date	Color	Non-Asbestos		Asbestos	Comment
			Fibrous	Non-Fibrous		
PLM	07/29/2015	Brown/Black	50%	50%	None Detected	<input checked="" type="checkbox"/>

**Client Sample ID:** IH-CDP-01B **Lab Sample ID:** 551507881-0154  
**Sample Description:** Upper level -- inside wood panel/Brown cooler door paper

TEST	Analyzed Date	Color	Non-Asbestos		Asbestos	Comment
			Fibrous	Non-Fibrous		
PLM	07/29/2015	Brown/Black	50%	50%	None Detected	<input checked="" type="checkbox"/>

**Client Sample ID:** IH-CDP-01C **Lab Sample ID:** 551507881-0155  
**Sample Description:** Upper level -- inside wood panel/Brown cooler door paper

TEST	Analyzed Date	Color	Non-Asbestos		Asbestos	Comment
			Fibrous	Non-Fibrous		
PLM	07/29/2015	Gray/Black	60%	40%	None Detected	<input checked="" type="checkbox"/>

**Client Sample ID:** IH-CDL-01A **Lab Sample ID:** 551507881-0156  
**Sample Description:** Upper level -- perimeter of cooler door/Brown cooler door liner

TEST	Analyzed Date	Color	Non-Asbestos		Asbestos	Comment
			Fibrous	Non-Fibrous		
PLM	07/29/2015	Black	90%	10%	None Detected	<input checked="" type="checkbox"/>

**Client Sample ID:** IH-CDL-01B **Lab Sample ID:** 551507881-0157  
**Sample Description:** Upper level -- perimeter of cooler door/Brown cooler door liner

TEST	Analyzed Date	Color	Non-Asbestos		Asbestos	Comment
			Fibrous	Non-Fibrous		
PLM	07/29/2015	Black	90%	10%	None Detected	<input checked="" type="checkbox"/>

**Client Sample ID:** IH-CDL-01C **Lab Sample ID:** 551507881-0158  
**Sample Description:** Upper level -- perimeter of cooler door/Brown cooler door liner

TEST	Analyzed Date	Color	Non-Asbestos		Asbestos	Comment
			Fibrous	Non-Fibrous		
PLM	07/29/2015	Black	90%	10%	None Detected	<input checked="" type="checkbox"/>





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## Test Report: Asbestos Analysis in Bulk Material for Occupational Health and Safety British Columbia Regulation 188/2011 via EPA 600/R-93/116 Method

**Client Sample ID:** IH-BP-01A **Lab Sample ID:** 551507881-0159  
**Sample Description:** Upper level – inside wood panels of cooler room/Black building paper

TEST	Analyzed Date	Color	Non-Asbestos		Asbestos	Comment
			Fibrous	Non-Fibrous		
PLM Grav. Reduction	07/29/2015	Brown	0.0%	100%	None Detected	<input checked="" type="checkbox"/>

**Client Sample ID:** IH-BP-01B **Lab Sample ID:** 551507881-0160  
**Sample Description:** Upper level – inside wood panels of cooler room/Black building paper

TEST	Analyzed Date	Color	Non-Asbestos		Asbestos	Comment
			Fibrous	Non-Fibrous		
PLM Grav. Reduction	07/29/2015	Brown	0.0%	100%	None Detected	<input checked="" type="checkbox"/>

**Client Sample ID:** IH-BP-01C **Lab Sample ID:** 551507881-0161  
**Sample Description:** Upper level – inside wood panels of cooler room/Black building paper

TEST	Analyzed Date	Color	Non-Asbestos		Asbestos	Comment
			Fibrous	Non-Fibrous		
PLM Grav. Reduction	07/29/2015	Brown	0.0%	100%	None Detected	<input checked="" type="checkbox"/>

**Client Sample ID:** IH-EWPC-01A **Lab Sample ID:** 551507881-0162  
**Sample Description:** West window of building between pane & frame/White exterior window pane caulking

TEST	Analyzed Date	Color	Non-Asbestos		Asbestos	Comment
			Fibrous	Non-Fibrous		
PLM Grav. Reduction	07/29/2015	White	0.0%	100%	None Detected	<input checked="" type="checkbox"/>

**Client Sample ID:** IH-EWPC-01B **Lab Sample ID:** 551507881-0163  
**Sample Description:** West window of building between pane & frame/White exterior window pane caulking

TEST	Analyzed Date	Color	Non-Asbestos		Asbestos	Comment
			Fibrous	Non-Fibrous		
PLM Grav. Reduction	07/29/2015	White	0.0%	100%	None Detected	<input checked="" type="checkbox"/>

**Client Sample ID:** IH-EWPC-01C **Lab Sample ID:** 551507881-0164  
**Sample Description:** West window of building between pane & frame/White exterior window pane caulking

TEST	Analyzed Date	Color	Non-Asbestos		Asbestos	Comment
			Fibrous	Non-Fibrous		
PLM Grav. Reduction	07/29/2015	White	0.0%	100%	None Detected	<input checked="" type="checkbox"/>

**Client Sample ID:** MB-PI-01A **Lab Sample ID:** 551507881-0168  
**Sample Description:** Ceiling space in north east exit/White aerosol

TEST	Analyzed Date	Color	Non-Asbestos		Asbestos	Comment
			Fibrous	Non-Fibrous		
PLM	07/29/2015	Gray	50%	10%	40% Chrysotile	<input type="checkbox"/>

**Client Sample ID:** MB-PI-01B **Lab Sample ID:** 551507881-0169  
**Sample Description:** Ceiling space in north east exit/White aerosol

TEST	Analyzed Date	Color	Non-Asbestos		Asbestos	Comment
			Fibrous	Non-Fibrous		
PLM	07/29/2015				Stop Positive (Not Analyzed)	



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Customer PO: 123220330.300  
Project ID:

## Test Report: Asbestos Analysis in Bulk Material for Occupational Health and Safety British Columbia Regulation 188/2011 via EPA 600/R-93/116 Method

**Client Sample ID:** MB-PI-01C **Lab Sample ID:** 551507881-0170  
**Sample Description:** Ceiling space in north east exit/White aerosol

TEST	Analyzed Date	Color	Non-Asbestos		Asbestos	Comment
			Fibrous	Non-Fibrous		
PLM	07/29/2015				Stop Positive (Not Analyzed)	

**Client Sample ID:** MB-PW-01A **Lab Sample ID:** 551507881-0171  
**Sample Description:** Ceiling space in north east exit/White woven aerosol pipe wrap

TEST	Analyzed Date	Color	Non-Asbestos		Asbestos	Comment
			Fibrous	Non-Fibrous		
PLM	07/29/2015	White	95%	5%	None Detected	<input checked="" type="checkbox"/>

**Client Sample ID:** MB-PW-01B **Lab Sample ID:** 551507881-0172  
**Sample Description:** Ceiling space in north east exit/White woven aerosol pipe wrap

TEST	Analyzed Date	Color	Non-Asbestos		Asbestos	Comment
			Fibrous	Non-Fibrous		
PLM	07/29/2015	White	95%	5%	None Detected	<input checked="" type="checkbox"/>

**Client Sample ID:** MB-PW-01C **Lab Sample ID:** 551507881-0173  
**Sample Description:** Ceiling space in north east exit/White woven aerosol pipe wrap

TEST	Analyzed Date	Color	Non-Asbestos		Asbestos	Comment
			Fibrous	Non-Fibrous		
PLM	07/29/2015	White	90%	10%	None Detected	<input checked="" type="checkbox"/>

**Client Sample ID:** MB-PS-01A **Lab Sample ID:** 551507881-0174  
**Sample Description:** Interior wall west of plant office/Blue sprinkler pipe sealant

TEST	Analyzed Date	Color	Non-Asbestos		Asbestos	Comment
			Fibrous	Non-Fibrous		
PLM Grav. Reduction	07/30/2015	Blue	0.0%	98.6%	1.4% Chrysotile	<input type="checkbox"/>

**Client Sample ID:** MB-PS-01B **Lab Sample ID:** 551507881-0175  
**Sample Description:** East wall of evaporator adjacent to vit. shed/Blue sprinkler pipe sealant

TEST	Analyzed Date	Color	Non-Asbestos		Asbestos	Comment
			Fibrous	Non-Fibrous		
PLM Grav. Reduction	07/30/2015				Positive Stop (Not Analyzed)	

**Client Sample ID:** MB-PS-01C **Lab Sample ID:** 551507881-0176  
**Sample Description:** Interior wall by south west exit /Blue sprinkler pipe sealant

TEST	Analyzed Date	Color	Non-Asbestos		Asbestos	Comment
			Fibrous	Non-Fibrous		
PLM Grav. Reduction	07/30/2015				Positive Stop (Not Analyzed)	

**Client Sample ID:** MB-MG-01A **Lab Sample ID:** 551507881-0177  
**Sample Description:** Canning crew station/Black mechanical gasket

TEST	Analyzed Date	Color	Non-Asbestos		Asbestos	Comment
			Fibrous	Non-Fibrous		
PLM Grav. Reduction	07/30/2015	Black/Blue	0.0%	100%	None Detected	<input checked="" type="checkbox"/>





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EMSL Canada Order 551507881  
Customer ID: 55JACQ30L  
Customer PO: 123220330.300  
Project ID:

## Test Report: Asbestos Analysis in Bulk Material for Occupational Health and Safety British Columbia Regulation 188/2011 via EPA 600/R-93/116 Method

**Client Sample ID:** MB-MG-01B **Lab Sample ID:** 551507881-0178  
**Sample Description:** Canning crew station/Black mechanical gasket

TEST	Analyzed Date	Color	Non-Asbestos		Asbestos	Comment
			Fibrous	Non-Fibrous		
PLM Grav. Reduction	07/30/2015	Black/Blue	0.0%	100%	None Detected	<input checked="" type="checkbox"/>

**Client Sample ID:** MB-MG-01C **Lab Sample ID:** 551507881-0179  
**Sample Description:** Canning crew station/Black mechanical gasket

TEST	Analyzed Date	Color	Non-Asbestos		Asbestos	Comment
			Fibrous	Non-Fibrous		
PLM Grav. Reduction	07/30/2015	Black/Blue	0.0%	100%	None Detected	<input checked="" type="checkbox"/>

**Client Sample ID:** MB-MA-01A **Lab Sample ID:** 551507881-0180  
**Sample Description:** Yellow separator/Black mastic

TEST	Analyzed Date	Color	Non-Asbestos		Asbestos	Comment
			Fibrous	Non-Fibrous		
PLM Grav. Reduction	07/30/2015	Black	0.0%	100%	None Detected	<input checked="" type="checkbox"/>

**Client Sample ID:** MB-MA-01B **Lab Sample ID:** 551507881-0181  
**Sample Description:** Yellow separator/Black mastic

TEST	Analyzed Date	Color	Non-Asbestos		Asbestos	Comment
			Fibrous	Non-Fibrous		
PLM Grav. Reduction	07/30/2015	Black	0.0%	100%	None Detected	<input checked="" type="checkbox"/>

**Client Sample ID:** MB-MA-01C **Lab Sample ID:** 551507881-0182  
**Sample Description:** Yellow separator/Black mastic

TEST	Analyzed Date	Color	Non-Asbestos		Asbestos	Comment
			Fibrous	Non-Fibrous		
PLM Grav. Reduction	07/30/2015	Black	0.0%	100%	None Detected	<input checked="" type="checkbox"/>

**Client Sample ID:** MB-MG-02A **Lab Sample ID:** 551507881-0183  
**Sample Description:** Press in south east of the building/Silver mechanical gasket

TEST	Analyzed Date	Color	Non-Asbestos		Asbestos	Comment
			Fibrous	Non-Fibrous		
PLM Grav. Reduction	07/30/2015	Gray	0.0%	70.4%	29.6% Chrysotile	<input type="checkbox"/>

**Client Sample ID:** MB-MG-02B **Lab Sample ID:** 551507881-0184  
**Sample Description:** Press in south east of the building/Silver mechanical gasket

TEST	Analyzed Date	Color	Non-Asbestos		Asbestos	Comment
			Fibrous	Non-Fibrous		
PLM Grav. Reduction	07/30/2015				Positive Stop (Not Analyzed)	

**Client Sample ID:** MB-MG-02C **Lab Sample ID:** 551507881-0185  
**Sample Description:** Press in south east of the building/Silver mechanical gasket

TEST	Analyzed Date	Color	Non-Asbestos		Asbestos	Comment
			Fibrous	Non-Fibrous		
PLM Grav. Reduction	07/30/2015				Positive Stop (Not Analyzed)	



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EMSL Canada Order 551507881  
Customer ID: 55JACQ30L  
Customer PO: 123220330.300  
Project ID:

## Test Report: Asbestos Analysis in Bulk Material for Occupational Health and Safety British Columbia Regulation 188/2011 via EPA 600/R-93/116 Method

**Client Sample ID:** MB-IWPC-01A **Lab Sample ID:** 551507881-0186

**Sample Description:** N.west cor. of bldg btwn pane & window/White interior window pane caulking

TEST	Analyzed Date	Color	Non-Asbestos		Asbestos	Comment
			Fibrous	Non-Fibrous		
PLM Grav. Reduction	07/30/2015	White	0.0%	100%	None Detected	<input checked="" type="checkbox"/>

**Client Sample ID:** MB-IWPC-01B **Lab Sample ID:** 551507881-0187

**Sample Description:** W.side of bldg btwn pane & window/White interior window pane caulking

TEST	Analyzed Date	Color	Non-Asbestos		Asbestos	Comment
			Fibrous	Non-Fibrous		
PLM Grav. Reduction	07/30/2015	White	0.0%	100%	None Detected	<input checked="" type="checkbox"/>

**Client Sample ID:** MB-IWPC-01C **Lab Sample ID:** 551507881-0188

**Sample Description:** S.west cor. of bldg btwn pane & window/White interior window pane caulking

TEST	Analyzed Date	Color	Non-Asbestos		Asbestos	Comment
			Fibrous	Non-Fibrous		
PLM Grav. Reduction	07/30/2015	White	0.0%	100%	None Detected	<input checked="" type="checkbox"/>

**Client Sample ID:** MB-IWPC-02A **Lab Sample ID:** 551507881-0189

**Sample Description:** Ext. windows of plant ofc. btwn pane & window/by NE cor. of bldg/ Yellow interior window pane caulking

TEST	Analyzed Date	Color	Non-Asbestos		Asbestos	Comment
			Fibrous	Non-Fibrous		
PLM	07/30/2015	White	0%	100%	None Detected	<input checked="" type="checkbox"/>

**Client Sample ID:** MB-IWPC-02B **Lab Sample ID:** 551507881-0190

**Sample Description:** Ext. windows of plant ofc. btwn pane & window/by NE cor. of bldg/ Yellow interior window pane caulking

TEST	Analyzed Date	Color	Non-Asbestos		Asbestos	Comment
			Fibrous	Non-Fibrous		
PLM	07/30/2015	White	0%	100%	None Detected	<input checked="" type="checkbox"/>

**Client Sample ID:** MB-IWPC-02C **Lab Sample ID:** 551507881-0191

**Sample Description:** Ext. windows of plant ofc. btwn pane & window/by NE cor. of bldg/ Yellow interior window pane caulking

TEST	Analyzed Date	Color	Non-Asbestos		Asbestos	Comment
			Fibrous	Non-Fibrous		
PLM	07/30/2015	Gray	0%	100%	None Detected	<input checked="" type="checkbox"/>

**Client Sample ID:** MB-RI-01A **Lab Sample ID:** 551507881-0192

**Sample Description:** Mezzanine level-south of tank area around pipe/Yellow remnant insulation

TEST	Analyzed Date	Color	Non-Asbestos		Asbestos	Comment
			Fibrous	Non-Fibrous		
PLM	07/29/2015	Tan	90%	10%	None Detected	<input checked="" type="checkbox"/>

**Client Sample ID:** MB-RI-01B **Lab Sample ID:** 551507881-0193

**Sample Description:** Mezzanine level-south of tank area around pipe/Yellow remnant insulation

TEST	Analyzed Date	Color	Non-Asbestos		Asbestos	Comment
			Fibrous	Non-Fibrous		
PLM	07/29/2015	Tan	90%	10%	None Detected	<input checked="" type="checkbox"/>





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EMSL Canada Order 551507881  
Customer ID: 55JACQ30L  
Customer PO: 123220330.300  
Project ID:

## Test Report: Asbestos Analysis in Bulk Material for Occupational Health and Safety British Columbia Regulation 188/2011 via EPA 600/R-93/116 Method

**Client Sample ID:** MB-RI-01C **Lab Sample ID:** 551507881-0194  
**Sample Description:** Mezzanine level-south of tank area around pipe/Yellow remnant insulation

TEST	Analyzed Date	Color	Non-Asbestos		Asbestos	Comment
			Fibrous	Non-Fibrous		
PLM	07/29/2015	Brown	90%	10%	None Detected	<input checked="" type="checkbox"/>

**Client Sample ID:** MB-TL-01A **Lab Sample ID:** 551507881-0195  
**Sample Description:** Canning boiler by caning crew station/Brown woven tank liner

TEST	Analyzed Date	Color	Non-Asbestos		Asbestos	Comment
			Fibrous	Non-Fibrous		
PLM	07/29/2015	Black	70%	30%	None Detected	<input checked="" type="checkbox"/>

**Client Sample ID:** MB-TL-01B **Lab Sample ID:** 551507881-0196  
**Sample Description:** Canning boiler by caning crew station/Brown woven tank liner

TEST	Analyzed Date	Color	Non-Asbestos		Asbestos	Comment
			Fibrous	Non-Fibrous		
PLM	07/29/2015	Tan/Black	70%	30%	None Detected	<input checked="" type="checkbox"/>

**Client Sample ID:** MB-TL-01C **Lab Sample ID:** 551507881-0197  
**Sample Description:** Canning boiler by caning crew station/Brown woven tank liner

TEST	Analyzed Date	Color	Non-Asbestos		Asbestos	Comment
			Fibrous	Non-Fibrous		
PLM	07/29/2015	Brown/Black	70%	30%	None Detected	<input checked="" type="checkbox"/>

**Client Sample ID:** MB-BP-01A **Lab Sample ID:** 551507881-0198  
**Sample Description:** Mezzanine level-SW storage area under roof mat./Black roof paper

TEST	Analyzed Date	Color	Non-Asbestos		Asbestos	Comment
			Fibrous	Non-Fibrous		
PLM Grav. Reduction	07/30/2015	Black	0.0%	100%	None Detected	<input checked="" type="checkbox"/>

**Client Sample ID:** MB-BP-01B **Lab Sample ID:** 551507881-0199  
**Sample Description:** Mezzanine level-SW storage area under roof mat./Black roof paper

TEST	Analyzed Date	Color	Non-Asbestos		Asbestos	Comment
			Fibrous	Non-Fibrous		
PLM Grav. Reduction	07/30/2015	Black	0.0%	100%	None Detected	<input checked="" type="checkbox"/>

**Client Sample ID:** MB-BP-01C **Lab Sample ID:** 551507881-0200  
**Sample Description:** Mezzanine level-SW storage area under roof mat./Black roof paper

TEST	Analyzed Date	Color	Non-Asbestos		Asbestos	Comment
			Fibrous	Non-Fibrous		
PLM Grav. Reduction	07/30/2015	Black	0.0%	100%	None Detected	<input checked="" type="checkbox"/>

**Client Sample ID:** MB-EW-01A **Lab Sample ID:** 551507881-0201  
**Sample Description:** North west exit hanging from the ceiling/Black and tan woven electrical wrap

TEST	Analyzed Date	Color	Non-Asbestos		Asbestos	Comment
			Fibrous	Non-Fibrous		
PLM	07/29/2015	Tan/Black	60%	40%	None Detected	<input checked="" type="checkbox"/>



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EMSL Canada Order 551507881  
Customer ID: 55JACQ30L  
Customer PO: 123220330.300  
Project ID:

## Test Report: Asbestos Analysis in Bulk Material for Occupational Health and Safety British Columbia Regulation 188/2011 via EPA 600/R-93/116 Method

**Client Sample ID:** MB-EW-01B **Lab Sample ID:** 551507881-0202  
**Sample Description:** North west exit hanging from the ceiling/Black and tan woven electrical wrap

TEST	Analyzed Date	Color	Non-Asbestos		Asbestos	Comment
			Fibrous	Non-Fibrous		
PLM	07/29/2015	Tan/Black	60%	40%	None Detected	<input checked="" type="checkbox"/>

**Client Sample ID:** MB-EW-01C **Lab Sample ID:** 551507881-0203  
**Sample Description:** North west exit hanging from the ceiling/Black and tan woven electrical wrap

TEST	Analyzed Date	Color	Non-Asbestos		Asbestos	Comment
			Fibrous	Non-Fibrous		
PLM	07/29/2015	Gray/Black	40%	60%	None Detected	<input checked="" type="checkbox"/>

**Client Sample ID:** MB-PW-02A **Lab Sample ID:** 551507881-0204  
**Sample Description:** Mezzanine level -btwn west tanks in tank area/Black pipe wrap

TEST	Analyzed Date	Color	Non-Asbestos		Asbestos	Comment
			Fibrous	Non-Fibrous		
PLM Grav. Reduction	07/30/2015	Gray/Various	0.0%	100%	None Detected	<input checked="" type="checkbox"/>

**Client Sample ID:** MB-PW-02B **Lab Sample ID:** 551507881-0205  
**Sample Description:** Mezzanine level -btwn west tanks in tank area/Black pipe wrap

TEST	Analyzed Date	Color	Non-Asbestos		Asbestos	Comment
			Fibrous	Non-Fibrous		
PLM Grav. Reduction	07/30/2015	Gray/Various	0.0%	100%	None Detected	<input checked="" type="checkbox"/>

**Client Sample ID:** MB-PW-02C **Lab Sample ID:** 551507881-0206  
**Sample Description:** Mezzanine level -btwn west tanks in tank area/Black pipe wrap

TEST	Analyzed Date	Color	Non-Asbestos		Asbestos	Comment
			Fibrous	Non-Fibrous		
PLM Grav. Reduction	07/30/2015	Gray/Various	0.0%	100%	None Detected	<input checked="" type="checkbox"/>

**Client Sample ID:** MB-TF-01A **Lab Sample ID:** 551507881-0207  
**Sample Description:** Mezzanine/L-on wood staircase south of tank area/Black textured floor

TEST	Analyzed Date	Color	Non-Asbestos		Asbestos	Comment
			Fibrous	Non-Fibrous		
PLM Grav. Reduction	07/30/2015	Brown/Black	0.0%	100%	None Detected	<input checked="" type="checkbox"/>

**Client Sample ID:** MB-TF-01B **Lab Sample ID:** 551507881-0208  
**Sample Description:** Mezzanine/L-on wood staircase south of tank area/Black textured floor

TEST	Analyzed Date	Color	Non-Asbestos		Asbestos	Comment
			Fibrous	Non-Fibrous		
PLM Grav. Reduction	07/30/2015	Brown/Black	0.0%	100%	None Detected	<input checked="" type="checkbox"/>

**Client Sample ID:** MB-TF-01C **Lab Sample ID:** 551507881-0209  
**Sample Description:** Mezzanine/L-on wood staircase south of tank area/Black textured floor

TEST	Analyzed Date	Color	Non-Asbestos		Asbestos	Comment
			Fibrous	Non-Fibrous		
PLM Grav. Reduction	07/30/2015	Brown/Black	0.0%	100%	None Detected	<input checked="" type="checkbox"/>





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EMSL Canada Order 551507881  
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**Fax:**  
**Collected:**  
**Received:** 07/22/2015  
**Analyzed:** 07/30/2015  
**Proj:** GOG/123220330.300.100

**Client Sample ID:** WS-CP-01

**Lab Sample ID:** 551507881-0210

**Sample Description:** Lower east wall of shed/Grey cement paneling

TEST	Analyzed Date	Color	Non-Asbestos		Asbestos	Comment
			Fibrous	Non-Fibrous		
PLM	07/29/2015	Gray	0%	80%	20% Chrysotile	

No Asbestos Detected
 Between OHS BC Regulation 188/2011 and Expected Limit of Detection
 Above OHS BC Regulation 188/2011 Limit

These guidance limits are typically used in most scenarios. More stringent local or project specific guidelines may apply.

### Analyst(s)

Jon Delos Santos	PLM	(16)
	PLM Grav. Reduction	(41)
Natalie D'Amico	PLM	(10)
	PLM	(3)
Nicole Dimou	PLM Grav. Reduction	(33)
	PLM	(33)
Nicole Yeo	400 PLM Pt Ct	(1)

Matthew Davis  
or other Approved Signatory

Any questions please contact Matthew Davis.

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Samples analyzed by EMSL Canada Inc. Mississauga, ON NVLAP Lab Code 200877-0

Report amended: 07/30/2015 17:01:26 Replaces initial report from: 07/29/2015 20:26:28 Reason Code: Client-Samples Added





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EMSL Canada Order 551507881  
Customer ID: 55JACQ30L  
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**Collected:**  
**Received:** 7/22/2015  
**Analyzed:** 7/29/2015

## Test Report: Asbestos Analysis in Bulk Material for Occupational Health and Safety British Columbia Regulation 188/2011 via EPA 600/R-93/116 Method

**Client Sample ID:** WS-CP-01

**Lab Sample ID:** 551507881-0210

**Sample Description:** Lower east wall of shed/Grey cement paneling

TEST	Analyzed Date	Color	Non-Asbestos		Asbestos	Comment
			Fibrous	Non-Fibrous		
PLM	7/29/2015	Gray	0%	80%	20% Chrysotile	

**Analyst(s):**

Nicole Yeo PLM (1)

**Reviewed and approved by:**

Matthew Davis  
or Other Approved Signatory

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Samples analyzed by EMSL Canada Inc. Mississauga, ON NVLAP Lab Code 200877-0

Initial report from: 07/29/2015 20:26:28







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EMSL Canada Order 551507881  
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Customer PO: 123220330.300  
Project ID:

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**Collected:**  
**Received:** 7/22/2015  
**Analyzed:** 7/29/2015  
**Proj:** GOG/123220330.300.100

## Test Report: Asbestos Analysis in Bulk Material for Occupational Health and Safety British Columbia Regulation 188/2011 via EPA 600/R-93/116 Method

**Client Sample ID:** TF-MG-01A **Lab Sample ID:** 551507881-0165  
**Sample Description:** East tank/Grey mechanical gasket

TEST	Analyzed Date	Color	Non-Asbestos		Asbestos	Comment
			Fibrous	Non-Fibrous		
PLM Grav. Reduction	7/29/2015	Gray	0.0%	60.8%	39.2% Chrysotile	

**Client Sample ID:** TF-MG-01B **Lab Sample ID:** 551507881-0166  
**Sample Description:** East tank/Grey mechanical gasket

TEST	Analyzed Date	Color	Non-Asbestos		Asbestos	Comment
			Fibrous	Non-Fibrous		
PLM Grav. Reduction	7/29/2015				Positive Stop (Not Analyzed)	

**Client Sample ID:** TF-MG-01C **Lab Sample ID:** 551507881-0167  
**Sample Description:** East tank/Grey mechanical gasket

TEST	Analyzed Date	Color	Non-Asbestos		Asbestos	Comment
			Fibrous	Non-Fibrous		
PLM Grav. Reduction	7/29/2015				Positive Stop (Not Analyzed)	

**Analyst(s):**  
Jon Delos Santos PLM Grav. Reduction (1)

**Reviewed and approved by:**  
  
Matthew Davis  
or Other Approved Signatory

None Detected = <0.5%. EMSL maintains liability limited to cost of analysis. This report relates only to the samples reported above and may not be reproduced, except in full, without written approval by EMSL. EMSL bears no responsibility for sample collection activities or analytical method limitations. Interpretation and use of test results are the responsibility of the client. Samples received in good condition unless otherwise noted. This report must not be used to claim product endorsement by NVLAP of any agency of the U.S. Government.

Samples analyzed by EMSL Canada Inc. Mississauga, ON NVLAP Lab Code 200877-0  
Report amended: 07/30/2015 17:01:26 Replaces initial report from: 07/29/2015 20:26:28 Reason Code: Client-Samples Added





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EMSL Canada Order 551507881  
Customer ID: 55JACQ30L  
Customer PO: 123220330.300  
Project ID:

**Attn:** Steve Chou  
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**Proj:** GOG/123220330.300.100

**Phone:** (604) 412-3004  
**Fax:**  
**Collected:**  
**Received:** 7/22/2015  
**Analyzed:** 7/29/2015

## Test Report: Asbestos Analysis in Bulk Material for Occupational Health and Safety British Columbia Regulation 188/2011 via EPA 600/R-93/116 Method

**Client Sample ID:** AD-DJC-01A

**Lab Sample ID:** 551507881-0098

**Sample Description:** Interior wall of washroom/Dry wall joint compound

TEST	Analyzed Date	Color	Non-Asbestos		Asbestos	Comment
			Fibrous	Non-Fibrous		
PLM	7/29/2015	White	0%	100%	None Detected	

**Client Sample ID:** AD-DJC-01B

**Lab Sample ID:** 551507881-0099

**Sample Description:** North wall of staff lounge/Dry wall joint compound

TEST	Analyzed Date	Color	Non-Asbestos		Asbestos	Comment
			Fibrous	Non-Fibrous		
PLM	7/29/2015	White	0%	100%	None Detected	

**Client Sample ID:** AD-DJC-01C

**Lab Sample ID:** 551507881-0100

**Sample Description:** East wall of reception/Dry wall joint compound

TEST	Analyzed Date	Color	Non-Asbestos		Asbestos	Comment
			Fibrous	Non-Fibrous		
PLM	7/29/2015	White	0%	100%	None Detected	

**Client Sample ID:** AD-DJC-01D

**Lab Sample ID:** 551507881-0101

**Sample Description:** North wall of office #3/Dry wall joint compound

TEST	Analyzed Date	Color	Non-Asbestos		Asbestos	Comment
			Fibrous	Non-Fibrous		
PLM	7/29/2015	Gray/White	0%	100%	None Detected	

**Client Sample ID:** AD-DJC-01E

**Lab Sample ID:** 551507881-0102

**Sample Description:** South wall of reception/Dry wall joint compound

TEST	Analyzed Date	Color	Non-Asbestos		Asbestos	Comment
			Fibrous	Non-Fibrous		
PLM	7/29/2015	White	0%	100%	None Detected	

**Client Sample ID:** AD-WPC-01A

**Lab Sample ID:** 551507881-0103

**Sample Description:** Window on E.side of washroom btwn pane & frame/Black window pane caulking

TEST	Analyzed Date	Color	Non-Asbestos		Asbestos	Comment
			Fibrous	Non-Fibrous		
PLM Grav. Reduction	7/29/2015	Black	0.0%	100%	None Detected	

**Client Sample ID:** AD-WPC-01B

**Lab Sample ID:** 551507881-0104

**Sample Description:** Window on E.side of washroom btwn pane & frame/Black window pane caulking

TEST	Analyzed Date	Color	Non-Asbestos		Asbestos	Comment
			Fibrous	Non-Fibrous		
PLM	7/29/2015	Black	0%	100%	None Detected	





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EMSL Canada Order 551507881  
Customer ID: 55JACQ30L  
Customer PO: 123220330.300  
Project ID:

## Test Report: Asbestos Analysis in Bulk Material for Occupational Health and Safety British Columbia Regulation 188/2011 via EPA 600/R-93/116 Method

**Client Sample ID:** AD-WPC-01C **Lab Sample ID:** 551507881-0105  
**Sample Description:** Window on E.side of washroom btwn pane & frame/Black window pane caulking

TEST	Analyzed Date	Color	Non-Asbestos		Asbestos	Comment
			Fibrous	Non-Fibrous		
PLM Grav. Reduction	7/29/2015	Black	0.0%	100%	None Detected	

**Client Sample ID:** AD-EPP-01A **Lab Sample ID:** 551507881-0106  
**Sample Description:** Upper east wall of the mechanical room/Grey electrical penetration putty

TEST	Analyzed Date	Color	Non-Asbestos		Asbestos	Comment
			Fibrous	Non-Fibrous		
PLM Grav. Reduction	7/29/2015	Gray/White	0.0%	87.7%	12.3% Chrysotile	

**Client Sample ID:** AD-EPP-01B **Lab Sample ID:** 551507881-0107  
**Sample Description:** Upper east wall of the mechanical room/Grey electrical penetration putty

TEST	Analyzed Date	Color	Non-Asbestos		Asbestos	Comment
			Fibrous	Non-Fibrous		
PLM Grav. Reduction	7/29/2015					Positive Stop (Not Analyzed)

**Client Sample ID:** AD-EPP-01C **Lab Sample ID:** 551507881-0108  
**Sample Description:** Upper east wall of the mechanical room/Grey electrical penetration putty

TEST	Analyzed Date	Color	Non-Asbestos		Asbestos	Comment
			Fibrous	Non-Fibrous		
PLM Grav. Reduction	7/29/2015					Positive Stop (Not Analyzed)

**Client Sample ID:** AD-CT-01A **Lab Sample ID:** 551507881-0109  
**Sample Description:** Mechanical room/2'x4' standard fissure and pinhole ceiling tile

TEST	Analyzed Date	Color	Non-Asbestos		Asbestos	Comment
			Fibrous	Non-Fibrous		
PLM	7/29/2015	Gray	80%	20%	None Detected	

**Client Sample ID:** AD-CT-01B **Lab Sample ID:** 551507881-0110  
**Sample Description:** Mechanical room/2'x4' standard fissure and pinhole ceiling tile

TEST	Analyzed Date	Color	Non-Asbestos		Asbestos	Comment
			Fibrous	Non-Fibrous		
PLM	7/29/2015	Gray	80%	20%	None Detected	

**Client Sample ID:** AD-CT-01C **Lab Sample ID:** 551507881-0111  
**Sample Description:** Mechanical room/2'x4' standard fissure and pinhole ceiling tile

TEST	Analyzed Date	Color	Non-Asbestos		Asbestos	Comment
			Fibrous	Non-Fibrous		
PLM	7/29/2015	Gray/White	80%	20%	None Detected	

**Client Sample ID:** AD-CT-02A **Lab Sample ID:** 551507881-0112  
**Sample Description:** Server room/1'x1' large and small pinhole ceiling tile

TEST	Analyzed Date	Color	Non-Asbestos		Asbestos	Comment
			Fibrous	Non-Fibrous		
PLM	7/29/2015	Tan	90%	10%	None Detected	





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EMSL Canada Order 551507881  
Customer ID: 55JACQ30L  
Customer PO: 123220330.300  
Project ID:

## Test Report: Asbestos Analysis in Bulk Material for Occupational Health and Safety British Columbia Regulation 188/2011 via EPA 600/R-93/116 Method

**Client Sample ID:** AD-CT-02B **Lab Sample ID:** 551507881-0113  
**Sample Description:** Server room/1'x1' large and small pinhole ceiling tile

TEST	Analyzed Date	Color	Non-Asbestos		Asbestos	Comment
			Fibrous	Non-Fibrous		
PLM	7/29/2015	Tan	90%	10%	None Detected	

**Client Sample ID:** AD-CT-02C **Lab Sample ID:** 551507881-0114  
**Sample Description:** Server room/1'x1' large and small pinhole ceiling tile

TEST	Analyzed Date	Color	Non-Asbestos		Asbestos	Comment
			Fibrous	Non-Fibrous		
PLM	7/29/2015	Brown	90%	10%	None Detected	

**Client Sample ID:** AD-FT-01 **Lab Sample ID:** 551507881-0115  
**Sample Description:** Mechanical room /12" x 12" pink stone pattern floor tile

TEST	Analyzed Date	Color	Non-Asbestos		Asbestos	Comment
			Fibrous	Non-Fibrous		
PLM Grav. Reduction	7/29/2015	Black/Beige	0.0%	98.9%	1.1% Chrysotile	

**Client Sample ID:** AD-FT-01-Mastic **Lab Sample ID:** 551507881-0115A  
**Sample Description:** Mechanical room /12" x 12" pink stone pattern floor tile

TEST	Analyzed Date	Color	Non-Asbestos		Asbestos	Comment
			Fibrous	Non-Fibrous		
PLM	7/29/2015	Black	0%	98%	2% Chrysotile	

**Client Sample ID:** AD-SF-01 **Lab Sample ID:** 551507881-0116  
**Sample Description:** Server room/White marble pattern

TEST	Analyzed Date	Color	Non-Asbestos		Asbestos	Comment
			Fibrous	Non-Fibrous		
PLM Grav. Reduction	7/29/2015	White	0.0%	100%	None Detected	

**Client Sample ID:** AD-RP-01A **Lab Sample ID:** 551507881-0117  
**Sample Description:** Roof- base of steel post holding wires/White penetration

TEST	Analyzed Date	Color	Non-Asbestos		Asbestos	Comment
			Fibrous	Non-Fibrous		
PLM Grav. Reduction	7/29/2015	White	0.0%	100%	None Detected	

**Client Sample ID:** AD-RP-01B **Lab Sample ID:** 551507881-0118  
**Sample Description:** Roof- base of steel post holding wires/White penetration

TEST	Analyzed Date	Color	Non-Asbestos		Asbestos	Comment
			Fibrous	Non-Fibrous		
PLM Grav. Reduction	7/29/2015	White	0.0%	100%	None Detected	

**Client Sample ID:** AD-RP-01C **Lab Sample ID:** 551507881-0119  
**Sample Description:** Roof- base of steel post holding wires/White penetration

TEST	Analyzed Date	Color	Non-Asbestos		Asbestos	Comment
			Fibrous	Non-Fibrous		
PLM Grav. Reduction	7/29/2015	White	0.0%	100%	None Detected	



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EMSL Canada Order 551507881  
Customer ID: 55JACQ30L  
Customer PO: 123220330.300  
Project ID:

## Test Report: Asbestos Analysis in Bulk Material for Occupational Health and Safety British Columbia Regulation 188/2011 via EPA 600/R-93/116 Method

**Client Sample ID:** AD-SL-01A **Lab Sample ID:** 551507881-0120  
**Sample Description:** Roof - base on ventilation stack/Black stack liner

TEST	Analyzed Date	Color	Non-Asbestos		Asbestos	Comment
			Fibrous	Non-Fibrous		
PLM Grav. Reduction	7/29/2015	Black	0.0%	100%	None Detected	

**Client Sample ID:** AD-SL-01B **Lab Sample ID:** 551507881-0121  
**Sample Description:** Roof - base on ventilation stack/Black stack liner

TEST	Analyzed Date	Color	Non-Asbestos		Asbestos	Comment
			Fibrous	Non-Fibrous		
PLM Grav. Reduction	7/29/2015	Black	0.0%	100%	None Detected	

**Client Sample ID:** AD-SL-01C **Lab Sample ID:** 551507881-0122  
**Sample Description:** Roof - base on ventilation stack/Black stack liner

TEST	Analyzed Date	Color	Non-Asbestos		Asbestos	Comment
			Fibrous	Non-Fibrous		
PLM Grav. Reduction	7/29/2015	Black	0.0%	100%	None Detected	

**Client Sample ID:** AD-RM-01A **Lab Sample ID:** 551507881-0123  
**Sample Description:** Floor of roof/Black roof material

TEST	Analyzed Date	Color	Non-Asbestos		Asbestos	Comment
			Fibrous	Non-Fibrous		
PLM Grav. Reduction	7/29/2015	Black	0.0%	100%	None Detected	

**Client Sample ID:** AD-RM-01B **Lab Sample ID:** 551507881-0124  
**Sample Description:** Floor of roof/Black roof material

TEST	Analyzed Date	Color	Non-Asbestos		Asbestos	Comment
			Fibrous	Non-Fibrous		
PLM Grav. Reduction	7/29/2015	Black	0.0%	100%	None Detected	

**Client Sample ID:** AD-RM-01C **Lab Sample ID:** 551507881-0125  
**Sample Description:** Floor of roof/Black roof material

TEST	Analyzed Date	Color	Non-Asbestos		Asbestos	Comment
			Fibrous	Non-Fibrous		
PLM Grav. Reduction	7/29/2015	Black	0.0%	100%	None Detected	

**Client Sample ID:** AD-VM-01A **Lab Sample ID:** 551507881-0126  
**Sample Description:** Roof - base on ventilation stack/Clear vent mastic

TEST	Analyzed Date	Color	Non-Asbestos		Asbestos	Comment
			Fibrous	Non-Fibrous		
PLM Grav. Reduction	7/29/2015	Clear	0.0%	100%	None Detected	

**Client Sample ID:** AD-VM-01B **Lab Sample ID:** 551507881-0127  
**Sample Description:** Roof - base on ventilation stack/Clear vent mastic

TEST	Analyzed Date	Color	Non-Asbestos		Asbestos	Comment
			Fibrous	Non-Fibrous		
PLM Grav. Reduction	7/29/2015	Clear	0.0%	100%	None Detected	





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EMSL Canada Order 551507881  
Customer ID: 55JACQ30L  
Customer PO: 123220330.300  
Project ID:

## Test Report: Asbestos Analysis in Bulk Material for Occupational Health and Safety British Columbia Regulation 188/2011 via EPA 600/R-93/116 Method

**Client Sample ID:** AD-VM-01C **Lab Sample ID:** 551507881-0128  
**Sample Description:** Roof- base on ventilation stack/Clear vent mastic

TEST	Analyzed Date	Color	Non-Asbestos		Asbestos	Comment
			Fibrous	Non-Fibrous		
PLM Grav. Reduction	7/29/2015	Clear	0.0%	100%	None Detected	

**Client Sample ID:** AD-CBM-01A **Lab Sample ID:** 551507881-0129  
**Sample Description:** Mechanical room/Brown cove base mastic

TEST	Analyzed Date	Color	Non-Asbestos		Asbestos	Comment
			Fibrous	Non-Fibrous		
PLM Grav. Reduction	7/29/2015	Brown	0.0%	100%	None Detected	

**Client Sample ID:** AD-CBM-01B **Lab Sample ID:** 551507881-0130  
**Sample Description:** Mechanical room/Brown cove base mastic

TEST	Analyzed Date	Color	Non-Asbestos		Asbestos	Comment
			Fibrous	Non-Fibrous		
PLM Grav. Reduction	7/29/2015	Brown	0.0%	100%	None Detected	

**Client Sample ID:** AD-CBM-01C **Lab Sample ID:** 551507881-0131  
**Sample Description:** Mechanical room/Brown cove base mastic

TEST	Analyzed Date	Color	Non-Asbestos		Asbestos	Comment
			Fibrous	Non-Fibrous		
PLM Grav. Reduction	7/29/2015	Brown	0.0%	100%	None Detected	

### Analyst(s):

Jon Delos Santos PLM (6)  
PLM Grav. Reduction (14)  
Nicole Dimou PLM Grav. Reduction (6)  
Nicole Yeo PLM (7)

### Reviewed and approved by:

Matthew Davis  
or Other Approved Signatory

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Samples analyzed by EMSL Canada Inc. Mississauga, ON NVLAP Lab Code 200877-0

Report amended: 07/30/2015 17:01:26 Replaces initial report from: 07/29/2015 20:26:28 Reason Code: Client-Samples Added





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EMSL Canada Order 551507881  
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Customer PO: 123220330.300  
Project ID:

**Attn:** Steve Chou  
Stantec Consulting, Ltd.  
500 - 4730 Kingsway  
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**Proj:** GOG/123220330.300.100

**Phone:** (604) 412-3004  
**Fax:**  
**Collected:**  
**Received:** 7/22/2015  
**Analyzed:** 7/29/2015

## Test Report: Asbestos Analysis in Bulk Material for Occupational Health and Safety British Columbia Regulation 188/2011 via EPA 600/R-93/116 Method

**Client Sample ID:** LF-GM-01A **Lab Sample ID:** 551507881-0144  
**Sample Description:** South exterior side of the building/Black gutter mastic

TEST	Analyzed Date	Color	Non-Asbestos		Asbestos	Comment
			Fibrous	Non-Fibrous		
PLM	7/29/2015	Black	0%	100%	None Detected	

**Client Sample ID:** LF-GM-01B **Lab Sample ID:** 551507881-0145  
**Sample Description:** South exterior side of the building/Black gutter mastic

TEST	Analyzed Date	Color	Non-Asbestos		Asbestos	Comment
			Fibrous	Non-Fibrous		
PLM Grav. Reduction	7/29/2015	Black	0.0%	100%	None Detected	

**Client Sample ID:** LF-GM-01C **Lab Sample ID:** 551507881-0146  
**Sample Description:** South exterior side of the building/Black gutter mastic

TEST	Analyzed Date	Color	Non-Asbestos		Asbestos	Comment
			Fibrous	Non-Fibrous		
PLM Grav. Reduction	7/29/2015	Black	0.0%	100%	None Detected	

**Client Sample ID:** LF-BM-01A **Lab Sample ID:** 551507881-0147  
**Sample Description:** Chimney area west side of the building/Brick motor

TEST	Analyzed Date	Color	Non-Asbestos		Asbestos	Comment
			Fibrous	Non-Fibrous		
PLM	7/29/2015	Gray	0%	100%	None Detected	

**Client Sample ID:** LF-BM-01B **Lab Sample ID:** 551507881-0148  
**Sample Description:** Chimney area west side of the building/Brick motor

TEST	Analyzed Date	Color	Non-Asbestos		Asbestos	Comment
			Fibrous	Non-Fibrous		
PLM	7/29/2015	Gray	0%	100%	None Detected	

**Client Sample ID:** LF-BM-01C **Lab Sample ID:** 551507881-0149  
**Sample Description:** Chimney area west side of the building/Brick motor

TEST	Analyzed Date	Color	Non-Asbestos		Asbestos	Comment
			Fibrous	Non-Fibrous		
PLM	7/29/2015	Gray	0%	100%	None Detected	

**Client Sample ID:** LF-HS-01A **Lab Sample ID:** 551507881-0150  
**Sample Description:** Hanging from wood column on W.side of bldg/Grey heat shield

TEST	Analyzed Date	Color	Non-Asbestos		Asbestos	Comment
			Fibrous	Non-Fibrous		
PLM	7/29/2015	Gray	50%	20%	30% Chrysotile	





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EMSL Canada Order 551507881  
Customer ID: 55JACQ30L  
Customer PO: 123220330.300  
Project ID:

## Test Report: Asbestos Analysis in Bulk Material for Occupational Health and Safety British Columbia Regulation 188/2011 via EPA 600/R-93/116 Method

**Client Sample ID:** LF-HS-01B **Lab Sample ID:** 551507881-0151  
**Sample Description:** Hanging from wood column on W.side of bldg/Grey heat shield

TEST	Analyzed Date	Color	Non-Asbestos		Asbestos	Comment
			Fibrous	Non-Fibrous		
PLM	7/29/2015					Stop Positive (Not Analyzed)

**Client Sample ID:** LF-HS-01C **Lab Sample ID:** 551507881-0152  
**Sample Description:** Hanging from wood column on W.side of bldg/Grey heat shield

TEST	Analyzed Date	Color	Non-Asbestos		Asbestos	Comment
			Fibrous	Non-Fibrous		
PLM	7/29/2015					Stop Positive (Not Analyzed)

### Analyst(s):

Jon Delos Santos	PLM (2) PLM Grav. Reduction (1)
Nicole Dimou	PLM Grav. Reduction (1)
Nicole Yeo	PLM (3)

### Reviewed and approved by:

Matthew Davis  
or Other Approved Signatory

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Samples analyzed by EMSL Canada Inc. Mississauga, ON NVLAP Lab Code 200877-0

Report amended: 07/30/2015 17:01:26 Replaces initial report from: 07/29/2015 20:26:28 Reason Code: Client-Samples Added



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EMSL Canada Order 551507881  
Customer ID: 55JACQ30L  
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**Phone:** (604) 412-3004  
**Fax:**  
**Collected:**  
**Received:** 7/22/2015  
**Analyzed:** 7/29/2015

**Proj:** GOG/123220330.300.100

## Test Report: Asbestos Analysis in Bulk Material for Occupational Health and Safety British Columbia Regulation 188/2011 via EPA 600/R-93/116 Method

**Client Sample ID:** ODS-DJC-01A

**Lab Sample ID:** 551507881-0075

**Sample Description:** West wall/Dry wall joint compound

TEST	Analyzed Date	Color	Non-Asbestos		Asbestos	Comment
			Fibrous	Non-Fibrous		
PLM	7/29/2015	White	0%	100%	None Detected	

**Client Sample ID:** ODS-DJC-01B

**Lab Sample ID:** 551507881-0076

**Sample Description:** West wall of bathroom/Dry wall joint compound

TEST	Analyzed Date	Color	Non-Asbestos		Asbestos	Comment
			Fibrous	Non-Fibrous		
PLM	7/29/2015	White	0%	100%	None Detected	

**Client Sample ID:** ODS-DJC-01C

**Lab Sample ID:** 551507881-0077

**Sample Description:** West wall/Dry wall joint compound

TEST	Analyzed Date	Color	Non-Asbestos		Asbestos	Comment
			Fibrous	Non-Fibrous		
PLM	7/29/2015	White	0%	100%	None Detected	

**Client Sample ID:** ODS-DJC-01D

**Lab Sample ID:** 551507881-0078

**Sample Description:** East interior wall/Dry wall joint compound

TEST	Analyzed Date	Color	Non-Asbestos		Asbestos	Comment
			Fibrous	Non-Fibrous		
PLM	7/29/2015	White	0%	100%	None Detected	

**Client Sample ID:** ODS-DJC-01E

**Lab Sample ID:** 551507881-0079

**Sample Description:** North wall/Dry wall joint compound

TEST	Analyzed Date	Color	Non-Asbestos		Asbestos	Comment
			Fibrous	Non-Fibrous		
PLM	7/29/2015	White	0%	100%	None Detected	



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EMSL Canada Order 551507881  
Customer ID: 55JACQ30L  
Customer PO: 123220330.300  
Project ID:

**Test Report: Asbestos Analysis in Bulk Material for Occupational Health and Safety British Columbia Regulation 188/2011 via EPA 600/R-93/116 Method**

---

**Analyst(s):**

---

Jon Delos Santos PLM (2)  
Nicole Yeo PLM (3)

**Reviewed and approved by:**

Matthew Davis  
or Other Approved Signatory

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Samples analyzed by EMSL Canada Inc. Mississauga, ON NVLAP Lab Code 200877-0

Initial report from: 07/29/2015 20:26:28



# HAZARDOUS BUILDING MATERIALS ASSESSMENT

Appendix D Summary of Identified ACMs  
March 24, 2016




## Appendix D SUMMARY OF IDENTIFIED ACMs



# HAZARDOUS BUILDING MATERIALS ASSESSMENT

Appendix D Summary of Identified ACMs  
 March 24, 2016



**Table D-1 Summary of Identified ACMs – Cannery Building**

Identified ACM Description and Condition Information	
<p><b>Previously identified exterior cement in the following locations:</b></p> <ul style="list-style-type: none"> <li>• At the front entrance of the East Wing (exterior)</li> <li>• On the east wall of the Cannery building (exterior)</li> <li>• On the south wall of the Dryer Shed (exterior)</li> <li>• On the west wall of the Dryer Shed at the roof (exterior).</li> </ul>	
% Type	20% Chrysotile
Friability	Non-friable
Condition	Good
	
<p><b>Mechanical gasket, artifact serial #: KX.91.43.227. Similar large mechanical gaskets were observed in the Vitamin Oil Shed.</b></p>	
% Type	25% Chrysotile
Friability	Non-friable
Condition	Good
	
	

# HAZARDOUS BUILDING MATERIALS ASSESSMENT

Appendix D Summary of Identified ACMs  
 March 24, 2016

**Table D-1 Summary of Identified ACMs – Cannery Building**



Identified ACM Description and Condition Information	
<b>Mechanical gasket, artifact serial #: KX.92.32.92</b>	
% Type	25% Chrysotile
Friability	Non-friable
Condition	Good
	
<b>Mechanical gasket on artifact serial #: KX.92.32.8</b>	
% Type	40% Chrysotile
Friability	Non-friable
Condition	Poor
	



# HAZARDOUS BUILDING MATERIALS ASSESSMENT

Appendix D Summary of Identified ACMs  
 March 24, 2016

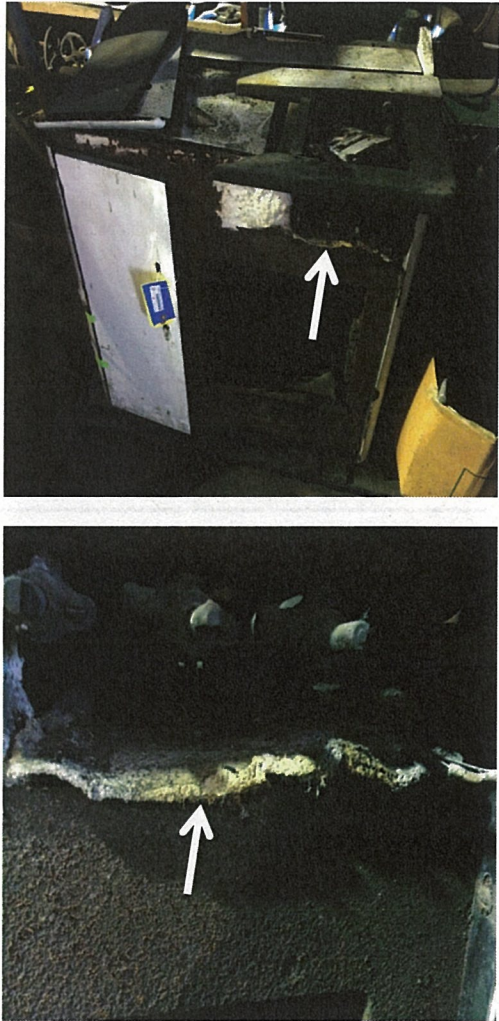
**Table D-1 Summary of Identified ACMs – Cannery Building**

Identified ACM Description and Condition Information	
<b>Mechanical gasket on artifact serial #: KX.92.32.8</b>	
% Type	35.8% Chrysotile
Friability	Non-friable
Condition	Good
	
<b>O-ring, artifact serial #: KX.93.5.373</b>	
% Type	35.3% Chrysotile
Friability	Non-friable
Condition	Good
	

# HAZARDOUS BUILDING MATERIALS ASSESSMENT

Appendix D Summary of Identified ACMs  
March 24, 2016

**Table D-1 Summary of Identified ACMs – Cannery Building**

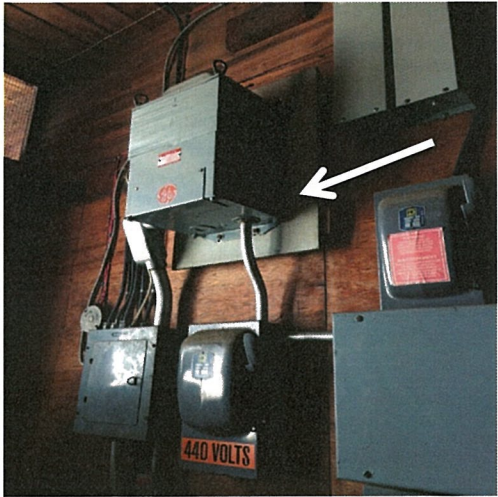

Identified ACM Description and Condition Information	
<b>Oven heat shield on artifact serial #: KX.91.42.108</b>	
% Type	7.4% Chrysotile
Friability	Friable
Condition	Poor
	



# HAZARDOUS BUILDING MATERIALS ASSESSMENT

Appendix D Summary of Identified ACMs  
 March 24, 2016


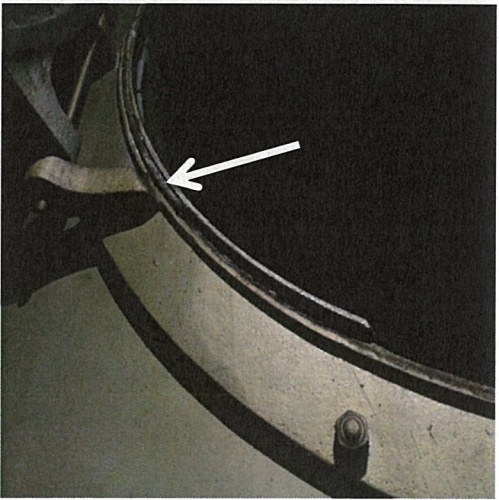
**Table D-1 Summary of Identified ACMs – Cannery Building**

Identified ACM Description and Condition Information	
<b>Cement panel behind GE transformer boxes throughout</b>	
% Type	15% Chrysotile
Friability	Non-friable
Condition	Good
	
<b>Grey roof panel on dryer shed</b>	
% Type	18.3% Chrysotile
Friability	Non-friable
Condition	Good
	

# HAZARDOUS BUILDING MATERIALS ASSESSMENT

Appendix D Summary of Identified ACMs  
 March 24, 2016

**Table D-1 Summary of Identified ACMs – Cannery Building**

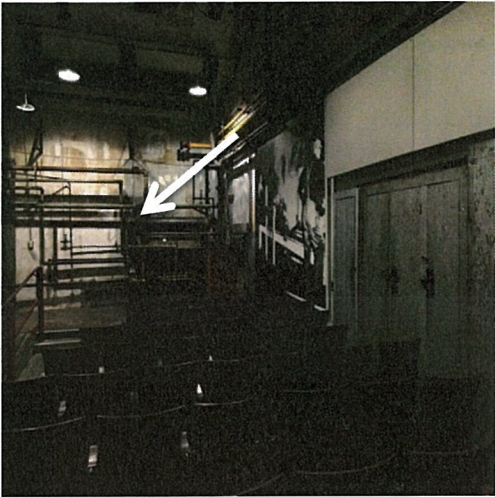
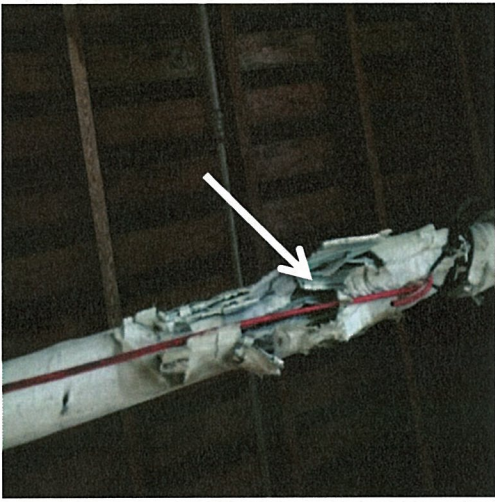
Identified ACM Description and Condition Information	
<b>Tan fibrous liner on the wood plank in tank room #3 of the vitamin oil shed</b>	
% Type	30% Chrysotile
Friability	Friable
Condition	Poor
	
<b>Tan fibrous liner around the perimeter of the hatch on the "HRT" boiler</b>	
% Type	30% Chrysotile
Friability	Friable
Condition	Poor
	



# HAZARDOUS BUILDING MATERIALS ASSESSMENT

Appendix D Summary of Identified ACMs  
 March 24, 2016

**Table D-1 Summary of Identified ACMs – Cannery Building**


Identified ACM Description and Condition Information	
<b>Dark brown mechanical gasket on the small tank in the northeast corner of the Boiler Room</b>	
% Type	42.3% Chrysotile
Friability	Non-friable
Condition	Good
	
<b>White Aircell mechanical pipe insulation by the north west exit</b>	
% Type	40% Chrysotile
Friability	Friable
Condition	Poor
	

# HAZARDOUS BUILDING MATERIALS ASSESSMENT

Appendix D Summary of Identified ACMs  
March 24, 2016

**Table D-1 Summary of Identified ACMs – Cannery Building**

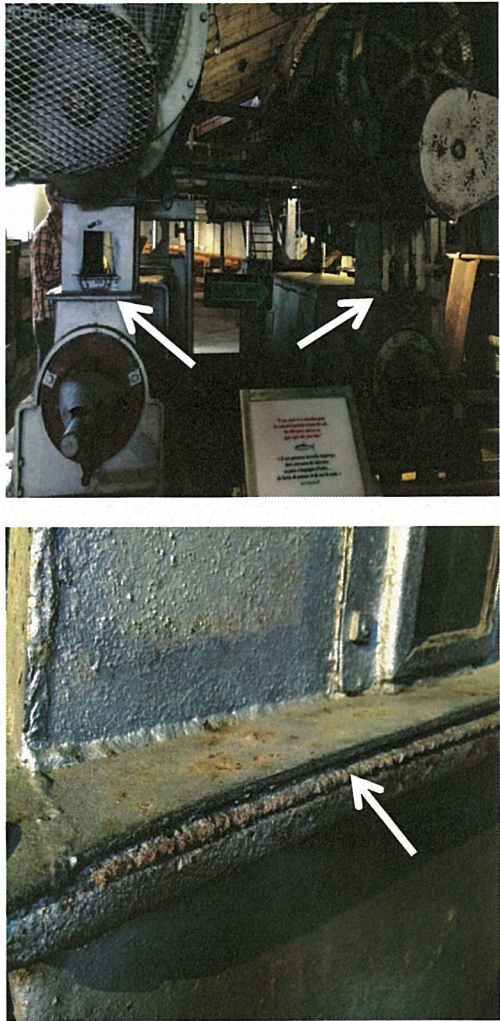
Identified ACM Description and Condition Information	
<b>Blue pipe sealant on sprinkler piping throughout Main Building</b>	
% Type	1.4% Chrysotile
Friability	Non-friable
Condition	Good

A photograph showing a vertical pipe in a room with wood-paneled walls. The pipe has a blue sealant applied to it. A white arrow points to the sealant. There are red markers on the pipe above and below the sealant. A metal electrical box is visible on the wall to the left of the pipe.

# HAZARDOUS BUILDING MATERIALS ASSESSMENT

Appendix D Summary of Identified ACMs  
March 24, 2016

**Table D-1 Summary of Identified ACMs – Cannery Building**


Identified ACM Description and Condition Information	
<b>Silver mechanical gaskets on the presses in the reduction annex</b>	
% Type	29.6% Chrysotile
Friability	Non-friable
Condition	Good
	



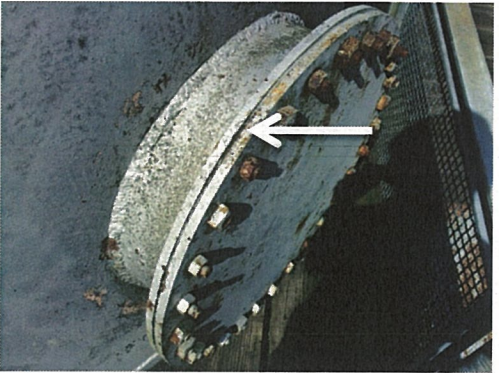
## HAZARDOUS BUILDING MATERIALS ASSESSMENT

Appendix D Summary of Identified ACMs  
 March 24, 2016

**Table D-2 Summary of Identified ACMs – Watchman's Shed**

Identified ACM Description and Condition Information	
<b>Grey cement paneling on the lower east wall</b>	
% Type	20% Chrysotile
Friability	Non-friable
Condition	Poor
	



**Table D-3 Summary of Identified ACMs – Tank Farm**

Identified ACM Description and Condition Information	
<b>Grey mechanical gasket on flanges attached to the two large tanks in the Tank Farm</b>	
% Type	39.2 % Chrysotile
Friability	Non-friable
Condition	Good
	


## HAZARDOUS BUILDING MATERIALS ASSESSMENT

Appendix D Summary of Identified ACMs  
March 24, 2016

**Table D-4 Summary of Identified ACMs – Administrative Building**

Identified ACM Description and Condition Information		
<b>Grey electrical penetration putty on the upper east wall of the Mechanical Room</b>		
% Type	12.3% Chrysotile	
Friability	Non-friable	
Condition	Good	
<b>12"x12" pink stone pattern floor tile and associated mastic in the mechanical/electrical room and the archive room</b>		
% Type	1.1-2% Chrysotile	
Friability	Non-friable	
Condition	Good	

**Table D-5 Summary of Identified ACMs – Lead Foundry**

Identified ACM Description and Condition Information		
<b>Grey heat shield hanging from wood column on the west side of the building</b>		
% Type	30% Chrysotile	
Friability	Friable	
Condition	Poor	



**HAZARDOUS BUILDING MATERIALS ASSESSMENT**

Appendix E Summary of Results of Analysis of Paint Chip Samples for Lead Content  
March 24, 2016

**Appendix E SUMMARY OF RESULTS OF ANALYSIS OF PAINT  
CHIP SAMPLES FOR LEAD CONTENT**

[Redacted content]





## HAZARDOUS BUILDING MATERIALS ASSESSMENT

Summary of Suspected LCP Chip Samples  
February 16, 2016

**Table E-1 Cannery Building – Suspected LCP Sample Collection and Analysis Summary**

Sample Number	Paint Description	Location	Result (PPM Lead)	Lead Containing
<b>Dryer Shed/Grinding and Sacking Room (DS)</b>				
DS-PB-01	Lime Green	Chute	11,000	Yes
DS-PB-02	Silver	Funnel	160	No
DS-PB-03	Silver	Dryer	820	Yes
DS-PB-04	Silver	Ground level – west wall of south east office	<90	No
DS-PB-05	Grey	North wall	<110	No
DS-PB-06	Cream	Dryer Hatch	450	No
<b>Vitamin Oil Shed (VOS)</b>				
VOS-PB-01	White	Interior wall	3,900	Yes
VOS-PB-02	Silver	Oil tank in tank room #1	3,200	Yes
VOS-PB-03	Black	Oil tank in tank room #3	1,500	Yes
<b>Boiler Room (BR)</b>				
BR-PB-01	Grey	East interior wall	3,800	Yes
BR-PB-02	Grey	Staircase	200,000	Yes
BR-PB-03	Silver	Tea Kettle boiler	<90	No
BR-PB-04	Red	Handrail in west side of the building	450	No
BR-PB-05	Black	Tea Kettle boiler	3,200	Yes
BR-PB-06	Green	Patterson boiler	77,000	Yes
<b>East Wing (EW)</b>				
EW-PB-01	Cream	Mechanical room wall	<90	No
EW-PB-02	Silver	Main door of east staff room	120	No
EW-PB-03	Grey	Interior wall of west staff room	15,000	Yes
EW-PB-04	Teal	Interior wall of west staff room	2,900	Yes
EW-PB-05	White	West interior wall	8,700	Yes
EW-PB-06	Cream	Mezzanine Level wall	690	Yes
<b>Ice House (IH)</b>				
IH-PB-01	Cream	Upper level walls	3,600	Yes
IH-PB-02	Red	Upper level switch boxes	870	Yes
IH-PB-03	Black	Upper level – lower walls	3,100	Yes



## HAZARDOUS BUILDING MATERIALS ASSESSMENT

Summary of Suspected LCP Chip Samples  
February 16, 2016

**Table E-1 Cannery Building – Suspected LCP Sample Collection and Analysis Summary**

Sample Number	Paint Description	Location	Result (PPM Lead)	Lead Containing
<b>Main Building (MB)</b>				
MB-PB-01	White	Interior wood column on west side of building	7,200	Yes
MB-PB-02	Teal	Door of plant office by north west side of building	2,400	Yes
MB-PB-03	Silver	Interior wall on south side of building	320	No
MB-PB-04	Silver	Mezzanine level – south of tank area	15,000	Yes
MB-PB-05	White	Window trim on plant office	3,300	Yes
MB-PB-06	White	Interior wood panel walls on north west side of building	7,800	Yes
MB-PB-07	Black	Black platform north west side of building	<210	No
MB-PB-08	White	Wood column in loft area 3	2,200	Yes
MB-PB-09	Blue	Upper Level – mechanical room west of Dryer Shed	14,000	Yes
MB-PB-11	Teal	Chute in south west side of building	18,000	Yes
MB-PB-12	Green	Evaporator	2,600	Yes
MB-PB-13	Yellow	Evaporator	26,000	Yes
MB-PB-14	Silver	Evaporator	22,000	Yes
MB-PB-15	Dark green	Stairs in evaporator room	19,000	Yes
MB-PB-16	Silver	Interior wall in separator room	450	No
MB-PB-17	Yellow	Interior wall in separator room	1,400	Yes
MB-PB-18	Green	Interior wall in evaporator room	3,500	Yes
MB-PB-19	Red	Handrails west of Dryer Shed	<330	No
MB-PB-20	Silver	Press	660	Yes

## HAZARDOUS BUILDING MATERIALS ASSESSMENT

Summary of Suspected LCP Chip Samples  
February 16, 2016

**Table E-2 Watchman's Shed – Suspected LCP Sample Collection and Analysis Summary**

Sample Number	Paint Description	Location	Result (PPM Lead)	Lead Containing
WS-PB-01	Teal	Interior wall and trim	740	Yes
WS-PB-02	Green	Floor	27,000	Yes

**Table E-3 Tank Farm – Suspected LCP Sample Collection and Analysis Summary**

Sample Number	Paint Description	Location	Result (PPM Lead)	Lead Containing
FT-PB-01	Red	Pipes	52,000	Yes
FT-PB-02	Grey	On tank	120,000	Yes
FT-PB-03	Blue	On pump	1,100	Yes

**Table E-4 Administrative Building – Suspected LCP Sample Collection and Analysis Summary**

Sample Number	Paint Description	Location	Result (PPM Lead)	Lead Containing
AD-PB-01	White	Exterior wall	180	No
AD-PB-02	Red	Exterior trim	420	No
AD-PB-03	Yellow	Curb on east side of the building	6,500	Yes
AD-PB-04	Cream	Interior wall of server room	<90	No
AD-PB-05	White	Interior wall	640	Yes
AD-PB-06	Pink	Interior wall of library	<130	No

**Table E-5 Lead Foundry – Suspected LCP Sample Collection and Analysis Summary**

Sample Number	Paint Description	Location	Result (PPM Lead)	Lead Containing
LF-PB-01	White	Interior wall	11,000	Yes



## HAZARDOUS BUILDING MATERIALS ASSESSMENT

Summary of Suspected LCP Chip Samples  
February 16, 2016

**Table E-6 Oil Drum Storage – Suspected LCP Sample Collection and Analysis Summary**

Sample Number	Paint Description	Location	Result (PPM Lead)	Lead Containing
ODS-PB-01	White	Interior trim of garage	3,800	Yes
ODS-PB-02	Beige	Interior door trim	<90	No
ODS-PB-03	Light Beige	Interior wall	<90	No

**HAZARDOUS BUILDING MATERIALS ASSESSMENT**

Appendix F Laboratory Analytical Report—Lead: Paint Chip Analysis  
March 24, 2016

**Appendix F LABORATORY ANALYTICAL REPORT—LEAD:  
PAINT CHIP ANALYSIS**





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ProjectID:	

Attn: <b>Steve Chou</b> <b>Stantec Consulting, Ltd.</b> <b>500 - 4730 Kingsway</b> <b>Burnaby, BC V5H 0C6</b>	Phone: (604) 412-3004 Fax: Received: 07/22/15 11:06 AM Collected:
Project: <b>GOG/123220330.300.100</b>	

**Test Report: Lead in Paint Chips by Flame AAS (SW 846 3050B/7000B)\***

<i>Client Sample Description</i>	<i>Lab ID</i>	<i>Collected</i>	<i>Analyzed</i>	<i>Lead Concentration</i>
DS-PB-01	551507888-0001 Site: CHUTE Desc: LIME GREEN		7/28/2015	11000 ppm
DS-PB-02	551507888-0002 Site: FUNNEL Desc: SILVER		7/28/2015	160 ppm
DS-PB-03	551507888-0003 Site: DRYER Desc: SILVER		7/28/2015	820 ppm
DS-PB-04	551507888-0004 Site: GROUND LEVEL- WEST WALL OF SOUTH EAST OFFICE Desc: SILVER		7/28/2015	<90 ppm
DS-PB-05	551507888-0005 Site: NORTH WALL Desc: GREY Insufficient sample to reach reporting limit.		7/28/2015	<110 ppm
DS-PB-06	551507888-0006 Site: DRYER HATCH Desc: CREAM		7/28/2015	450 ppm

Lisa Podzyhun  
or other approved signatory

\*Analysis following Lead in Paint by EMSL SOP/Determination of Environmental Lead by FLAA. Reporting limit is 0.010 % wt based on the minimum sample weight per our SOP. Unless noted, results in this report are not blank corrected. This report relates only to the samples reported above and may not be reproduced, except in full, without written approval by EMSL. EMSL bears no responsibility for sample collection activities. Samples received in good condition unless otherwise noted. "<" (less than) result signifies that the analyte was not detected at or above the reporting limit. Measurement of uncertainty is available upon request. The QC data associated with the sample results included in this report meet the recovery and precision requirements established by the AIHA-LAP, unless specifically indicated otherwise.

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Initial report from 07/29/2015 09:32:36







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Project: GOG/123220330.300.100	

**Test Report: Lead in Paint Chips by Flame AAS (SW 846 3050B/7000B)\***

<i>Client Sample Description</i>	<i>Lab ID</i>	<i>Collected</i>	<i>Analyzed</i>	<i>Lead Concentration</i>
VOS-PB-01 Site: INTERIOR WALL Desc: WHITE	551507888-0007	7/28/2015		3900 ppm
VOS-PB-02 Site: OIL TANK IN TANK ROOM #1 Desc: SILVER	551507888-0008	7/28/2015		3200 ppm
VOS-PB-03 Site: OIL TANK IN TANK ROOM #3 Desc: BLACK	551507888-0009	7/28/2015		1500 ppm

Lisa Podzyhun  
or other approved signatory

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Initial report from 07/29/2015 09:41:53





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Collected:

Project: **GOG/123220330.300.100**

**Test Report: Lead in Paint Chips by Flame AAS (SW 846 3050B/7000B)\***

<i>Client Sample Description</i>	<i>Lab ID</i>	<i>Collected</i>	<i>Analyzed</i>	<i>Lead Concentration</i>
BR-PB-01 Site: EAST INTERIOR WALL Desc: GREY	551507888-0013		7/28/2015	3800 ppm
BR-PB-02 Site: STAIRCASE Desc: GREY	551507888-0014		7/28/2015	200000 ppm
BR-PB-03 Site: TEA KETTLE BOILER Desc: SILVER	551507888-0015		7/28/2015	<90 ppm
BR-PB-04 Site: HANDRAIL IN WEST SIDE OF THE BUILDING Desc: RED	551507888-0016		7/28/2015	450 ppm
BR-PB-05 Site: TEA KETTLE BOILER Desc: BLACK	551507888-0017		7/28/2015	3200 ppm
BR-PB-06 Site: PATTERSON BOILER Desc: GREEN	551507888-0018		7/28/2015	77000 ppm

Lisa Podzyhun  
or other approved signatory

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Collected:

Project: **GOG/123220330.300.100**

**Test Report: Lead in Paint Chips by Flame AAS (SW 846 3050B/7000B)\***

<i>Client Sample Description</i>	<i>Lab ID</i>	<i>Collected</i>	<i>Analyzed</i>	<i>Lead Concentration</i>
EW-PB-01 Site: MECHANICAL ROOM WALL Desc: CREAM	551507888-0025		7/28/2015	<90 ppm
EW-PB-02 Site: MAIN DOOR OF EAST STAFF ROOM Desc: SILVER	551507888-0026		7/28/2015	120 ppm
EW-PB-03 Site: INTERIOR WALL OF WEST STAFF ROOM Desc: GREY	551507888-0027		7/28/2015	15000 ppm
EW-PB-04 Site: INTERIOR WALL OF WEST STAFF ROOM Desc: TEAL	551507888-0028		7/28/2015	2900 ppm
EW-PB-05 Site: WEST INTERIOR WALL Desc: WHITE	551507888-0029		7/28/2015	8700 ppm
EW-PB-06 Site: MEZZANINE LEVEL WALL Desc: CREAM	551507888-0030		7/28/2015	690 ppm

Lisa Podzyhun  
or other approved signatory

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Project: **GOG/123220330.300.100**

**Test Report: Lead in Paint Chips by Flame AAS (SW 846 3050B/7000B)\***

<i>Client Sample Description</i>	<i>Lab ID</i>	<i>Collected</i>	<i>Analyzed</i>	<i>Lead Concentration</i>
IH-PB-01 Site: UPPER LEVEL WALLS Desc: CREAM	551507888-0033		7/28/2015	3600 ppm
IH-PB-02 Site: UPPER LEVEL SWITCH BOXES Desc: RED	551507888-0034		7/28/2015	870 ppm
IH-PB-03 Site: UPPER LEVEL LOWER WALLS Desc: BLACK	551507888-0035		7/28/2015	3100 ppm

Lisa Podzyhun  
or other approved signatory

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Initial report from 07/29/2015 09:50:00







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Collected:

Project: **GOG/123220330.300.100**

**Test Report: Lead in Paint Chips by Flame AAS (SW 846 3050B/7000B)\***

<i>Client Sample Description</i>	<i>Lab ID</i>	<i>Collected</i>	<i>Analyzed</i>	<i>Lead Concentration</i>
MB-PB-01 Site: INTERIOR WOOD COLUMN ON WEST SIDE OF BLDG Desc: WHITE	551507888-0036	7/28/2015	7/28/2015	7200 ppm
MB-PB-02 Site: DOOR OF PLANT OFFICE BY NORTH WEST SIDE OF BLDG Desc: TEAL	551507888-0037	7/28/2015	7/28/2015	2400 ppm
MB-PB-03 Site: INTERIOR WALL ON SOUTH SIDE OF BUILDING Desc: SILVER	551507888-0038	7/28/2015	7/28/2015	320 ppm
MB-PB-04 Site: MEZZANINE LEVEL- SOUTH OF TANK AREA Desc: SILVER	551507888-0039	7/28/2015	7/28/2015	15000 ppm
MB-PB-05 Site: WINDOW TRIM ON PLANT OFFICE Desc: WHITE	551507888-0040	7/28/2015	7/28/2015	3300 ppm
MB-PB-06 Site: INTERIOR WOOD PANEL WALLS ON NORTH WEST SIDE OF BL Desc: WHITE	551507888-0041	7/28/2015	7/28/2015	7800 ppm
MB-PB-07 Site: BLACK PLATFORM NORTH WEST SIDE OF BLDG Desc: BLACK Insufficient sample to reach reporting limit.	551507888-0042	7/28/2015	7/28/2015	<210 ppm
MB-PB-08 Site: WOOD COLUMN SOUTH WEST OF BOILER ROOM Desc: WHITE	551507888-0043	7/28/2015	7/28/2015	2200 ppm
MB-PB-09 Site: UPPER LEVEL MECHANICAL ROOM WEST OF DRYER SHED Desc: BLUE	551507888-0044	7/28/2015	7/28/2015	14000 ppm
MB-PB-10 Site: CHUTE IN SOUTH WEST SIDE OF BUILDING Desc: TEAL	551507888-0045	7/28/2015	7/28/2015	18000 ppm

Lisa Podzyhun  
or other approved signatory

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Report Amended: 02/17/2016 17:53:08 Replaces Report Amended: 02/16/2016 09:24:24. Reason Code: Client-Change to Sample ID

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 Fax:  
 Received: 07/22/15 11:06 AM  
 Collected:

Project: **GOG/123220330.300.100**

### Test Report: Lead in Paint Chips by Flame AAS (SW 846 3050B/7000B)\*

<i>Client Sample Description</i>	<i>Lab ID</i>	<i>Collected</i>	<i>Analyzed</i>	<i>Lead Concentration</i>
MB-PB-11 Site: EVAPORATOR Desc: GREEN	551507888-0046	7/28/2015		2600 ppm
MB-PB-12 Site: EVAPORATOR Desc: YELLOW	551507888-0047	7/28/2015		26000 ppm
MB-PB-13 Site: EVAPORATOR Desc: SILVER	551507888-0048	7/28/2015		22000 ppm
MB-PB-14 Site: STAIRS IN EVAPORATOR ROOM Desc: DARK GREEN	551507888-0049	7/28/2015		19000 ppm
MB-PB-15 Site: INTERIOR WALL IN SEPARTOR ROOM Desc: SILVER	551507888-0050	7/28/2015		450 ppm
MB-PB-16 Site: INTERIOR WALL IN SEPARTOR ROOM Desc: YELLOW	551507888-0051	7/28/2015		1400 ppm
MB-PB-17 Site: INTERIOR WALL IN EVAPORATOR ROOM Desc: TEAL	551507888-0052	7/28/2015		3500 ppm
MB-PB-18 Site: HANDRAILS WEST OF DRYER SHED Desc: RED Insufficient sample to reach reporting limit.	551507888-0053	7/28/2015		<330 ppm
MB-PB-19 Site: PRESS Desc: SILVER	551507888-0054	7/28/2015		660 ppm
MB-PB-20 Site: INTERIOR WALL & TRIM Desc: WHITE & TEAL LAYER	551507888-0055	7/28/2015		740 ppm

Lisa Podzyhun  
 or other approved signatory

\*Analysis following Lead in Paint by EMSL SOP/Determination of Environmental Lead by FLAA. Reporting limit is 0.010 % wt based on the minimum sample weight per our SOP. Unless noted, results in this report are not blank corrected. This report relates only to the samples reported above and may not be reproduced, except in full, without written approval by EMSL. EMSL bears no responsibility for sample collection activities. Samples received in good condition unless otherwise noted. "<" (less than) result signifies that the analyte was not detected at or above the reporting limit. Measurement of uncertainty is available upon request. The QC data associated with the sample results included in this report meet the recovery and precision requirements established by the AIHA-LAP, LLC, unless specifically indicated otherwise.

Samples analyzed by EMSL Canada Inc. Mississauga, ON A2LA Accredited Environmental Testing Cert #2845.08

Report Amended: 02/17/2016 17:53:08 Replaces Report Amended: 02/16/2016 09:24:24. Reason Code: Client-Change to Sample ID



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EMSL Canada Or 551507888  
CustomerID: 55JACQ30L  
CustomerPO: 123220330  
ProjectID:

Attn: **Steve Chou**  
**Stantec Consulting, Ltd.**  
**500 - 4730 Kingsway**  
**Burnaby, BC V5H 0C6**

Phone: (604) 412-3004  
Fax:  
Received: 07/22/15 11:06 AM  
Collected:

Project: **GOG/123220330.300.100**

**Test Report: Lead in Paint Chips by Flame AAS (SW 846 3050B/7000B)\***

<i>Client Sample Description</i>	<i>Lab ID</i>	<i>Collected</i>	<i>Analyzed</i>	<i>Lead Concentration</i>
WS-PB-01	551507888-0055 Site: INTERIOR WALL & TRIM Desc: WHITE & TEAL LAYER	7/28/2015		740 ppm
WS-PB-02	551507888-0056 Site: FLOOR Desc: GREEN	7/28/2015		27000 ppm

Lisa Podzyhun  
or other approved signatory

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Samples analyzed by EMSL Canada Inc. Mississauga, ON A2LA Accredited Environmental Testing Cert #2845.08

Initial report from 07/29/2015 09:54:34







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EMSL Canada Or	551507888
CustomerID:	55JACQ30L
CustomerPO:	123220330
ProjectID:	

Attn: <b>Steve Chou</b> <b>Stantec Consulting, Ltd.</b> <b>500 - 4730 Kingsway</b> <b>Burnaby, BC V5H 0C6</b>	Phone: (604) 412-3004 Fax: Received: 07/22/15 11:06 AM Collected:
Project: <b>GOG/123220330.300.100</b>	

**Test Report: Lead in Paint Chips by Flame AAS (SW 846 3050B/7000B)\***

<i>Client Sample Description</i>	<i>Lab ID</i>	<i>Collected</i>	<i>Analyzed</i>	<i>Lead Concentration</i>
FT-PB-01 Site: PIPES Desc: RED	551507888-0032		7/28/2015	52000 ppm
FT-PB-02 Site: (NOT ON COC) Desc: GREY ON TANK	551507888-0057		7/28/2015	120000 ppm
FT-PB-03 Site: (NOT ON COC) Desc: BLUE ON PUMP	551507888-0058		7/28/2015	1100 ppm

Lisa Podzyhun  
or other approved signatory

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Samples analyzed by EMSL Canada Inc. Mississauga, ON A2LA Accredited Environmental Testing Cert #2845.08

Report Amended: 02/16/2016 09:24:24 Replaces the Initial Report 07/29/2015 09:48:39. Reason Code: Client-Change to Sample ID







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**Burnaby, BC V5H 0C6**

Phone: (604) 412-3004  
Fax:  
Received: 07/22/15 11:06 AM  
Collected:

Project: **GOG/123220330.300.100**

**Test Report: Lead in Paint Chips by Flame AAS (SW 846 3050B/7000B)\***

<i>Client Sample Description</i>	<i>Lab ID</i>	<i>Collected</i>	<i>Analyzed</i>	<i>Lead Concentration</i>
AD-PB-01 Site: EXTERIOR WALL Desc: WHITE	551507888-0019	7/28/2015	7/28/2015	180 ppm
AD-PB-02 Site: EXTERIOR TRIM Desc: RED	551507888-0020	7/28/2015	7/28/2015	420 ppm
AD-PB-03 Site: CURB ON EAST SIDE OF THE BUILDING Desc: YELLOW	551507888-0021	7/28/2015	7/28/2015	6500 ppm
AD-PB-04 Site: INTERIOR WALL OF SERVER ROOM Desc: CREAM	551507888-0022	7/28/2015	7/28/2015	<90 ppm
AD-PB-05 Site: INTERIOR WALL Desc: WHITE	551507888-0023	7/28/2015	7/28/2015	640 ppm
AD-PB-06 Site: INTERIOR WALL OF LIBRARY Desc: PINK Insufficient sample to reach reporting limit.	551507888-0024	7/28/2015	7/28/2015	<130 ppm

Lisa Podzyhun  
or other approved signatory

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Samples analyzed by EMSL Canada Inc. Mississauga, ON A2LA Accredited Environmental Testing Cert #2845.08

Initial report from 07/29/2015 09:45:09





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CustomerPO: 123220330  
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**Burnaby, BC V5H 0C6**

Phone: (604) 412-3004  
Fax:  
Received: 07/22/15 11:06 AM  
Collected:

Project: **GOG/123220330.300.100**

**Test Report: Lead in Paint Chips by Flame AAS (SW 846 3050B/7000B)\***

<i>Client Sample Description</i>	<i>Lab ID</i>	<i>Collected</i>	<i>Analyzed</i>	<i>Lead Concentration</i>
LF-PB-01	551507888-0031		7/28/2015	11000 ppm
	Site: INTERIOR WALL Desc: WHITE			

\_\_\_\_\_  
Lisa Podzyhun  
or other approved signatory

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Samples analyzed by EMSL Canada Inc. Mississauga, ON A2LA Accredited Environmental Testing Cert #2845.08

Initial report from 07/29/2015 09:47:31





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**Burnaby, BC V5H 0C6**

Phone: (604) 412-3004

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Received: 07/22/15 11:06 AM

Collected:

Project: GOG/123220330.300.100

**Test Report: Lead in Paint Chips by Flame AAS (SW 846 3050B/7000B)\***

<i>Client Sample Description</i>	<i>Lab ID</i>	<i>Collected</i>	<i>Analyzed</i>	<i>Lead Concentration</i>
ODS-PB-01	551507888-0010		7/28/2015	3800 ppm
	Site: INTERIOR TRIM OF GARAGE Desc: WHITE			
ODS-PB-02	551507888-0011		7/28/2015	<90 ppm
	Site: INTERIOR DOOR TRIM Desc: BEIGE			
ODS-PB-03	551507888-0012		7/28/2015	<90 ppm
	Site: INTERIOR WALL Desc: LIGHT BEIGE			

Lisa Podzyhun  
or other approved signatory

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Samples analyzed by EMSL Canada Inc. Mississauga, ON A2LA Accredited Environmental Testing Cert #2845.08

Initial report from 07/29/2015 09:42:53



# HAZARDOUS BUILDING MATERIALS ASSESSMENT

Appendix G Summary of Identified LCPS  
March 24, 2016

## Appendix G SUMMARY OF IDENTIFIED LCPS


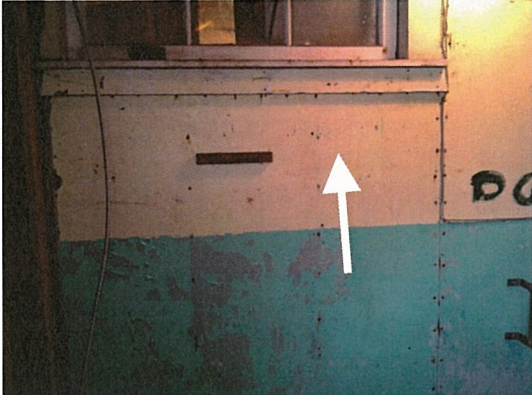





## HAZARDOUS BUILDING MATERIALS ASSESSMENT

Appendix G Summary of Identified LCPs  
March 24, 2016




**Table G-1 Summary of Identified LCPs – Cannery Building**

Identified LCP Description	Photo
<p>Green coloured paint on interior walls and window frames of the Evaporator and Separator Rooms (previously identified and re-sampled during the current assessment).</p> <p>This paint was observed to be in poor condition (bubbling, flaking or peeling).</p>	
<p>Yellow coloured paint on interior walls and window frames of the Evaporator and Separator Rooms (previously identified and re-sampled during the current assessment).</p> <p>This paint was observed to be in good condition (minimal bubbling, flaking or peeling).</p>	
<p>White coloured paint on the interior wall of the Vitamin Oil Shed (previously identified and re-sampled during the current assessment).</p> <p>This paint was observed to be in good condition (minimal bubbling, flaking or peeling).</p>	

# HAZARDOUS BUILDING MATERIALS ASSESSMENT

Appendix G Summary of Identified LCPs  
March 24, 2016

**Table G-1 Summary of Identified LCPs – Cannery Building**




Identified LCP Description	Photo
<p>White coloured paint on exterior walls of Vitamin Oil Shed (previously identified). This paint was observed to be in good condition (minimal bubbling, flaking or peeling).</p>	
<p>Burgundy coloured paint on exterior trim throughout the Cannery (previously identified). This paint was observed to be in good condition (minimal bubbling, flaking or peeling).</p>	
<p>Cream coloured paint on the Cannery building ceiling and west wall (previously identified). This paint was observed to be in poor condition (flaking and peeling).</p>	



# HAZARDOUS BUILDING MATERIALS ASSESSMENT

Appendix G Summary of Identified LCPs  
 March 24, 2016

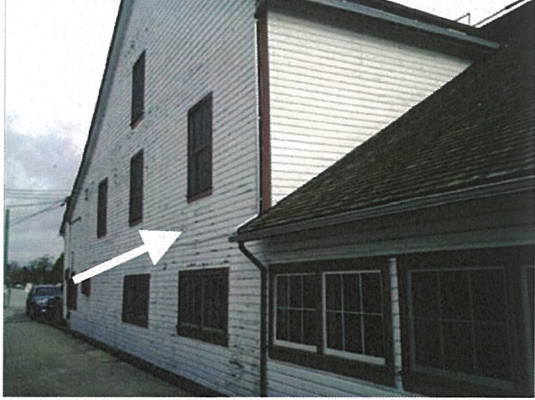


**Table G-1 Summary of Identified LCPs – Cannery Building**

Identified LCP Description	Photo
<p>Silver coloured paint on upper interior walls of the Ice House (previously identified).                      This paint was observed to be in good condition (minimal bubbling, flaking or peeling).</p>	 <p>A photograph of the interior of the Ice House. The upper portion of the wall is painted silver. A white arrow points to the silver-painted area above a white door. An illuminated 'EXIT' sign is visible above the door. The ceiling is made of dark wooden planks.</p>
<p>White coloured paint on lower interior walls of the Ice House (previously identified).                      This paint was observed to be in good condition (minimal bubbling, flaking or peeling).</p>	 <p>A photograph of the interior of the Ice House. The lower portion of the wall is painted white. A white arrow points to the white-painted area near a counter and shelving unit. The shelving unit has a sign that says 'STORE'.</p>
<p>White coloured paint on the North exterior wall (previously identified).                      This paint was observed to be in good condition (minimal bubbling, flaking or peeling).</p>	 <p>A photograph of the exterior of the Ice House. The North wall is painted white. A white arrow points to the white-painted area. The building has a dark roof and a large door on the right side.</p>

## HAZARDOUS BUILDING MATERIALS ASSESSMENT

Appendix G Summary of Identified LCPs  
 March 24, 2016

**Table G-1 Summary of Identified LCPs – Cannery Building**




Identified LCP Description	Photo
<p>White coloured paint on the West exterior wall (previously identified).                      This paint was observed to be in good condition (minimal bubbling, flaking or peeling).</p>	
<p>Lime green coloured paint on the chute of the Dryer Shed / Grinding and Sacking Room.                      This paint was observed to be in good condition (minimal bubbling, flaking or peeling).</p>	
<p>Silver coloured paint on the dryers in the Dryer Shed.                      This paint was observed to be in good condition (minimal bubbling, flaking or peeling).</p>	<p>No Photo.</p>
<p>Silver coloured paint on the oil tanks of the Vitamin Oil Shed.                      This paint was observed to be in good condition (minimal bubbling, flaking or peeling).</p>	



# HAZARDOUS BUILDING MATERIALS ASSESSMENT

Appendix G Summary of Identified LCPs  
March 24, 2016

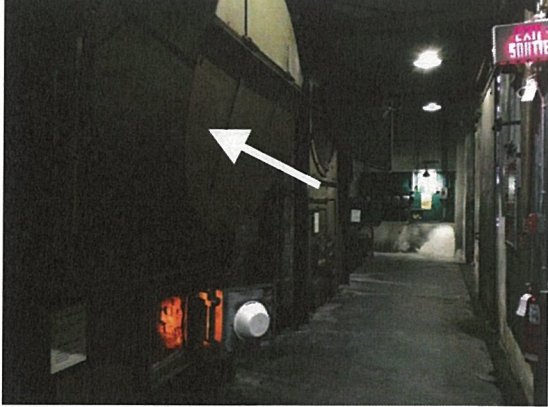
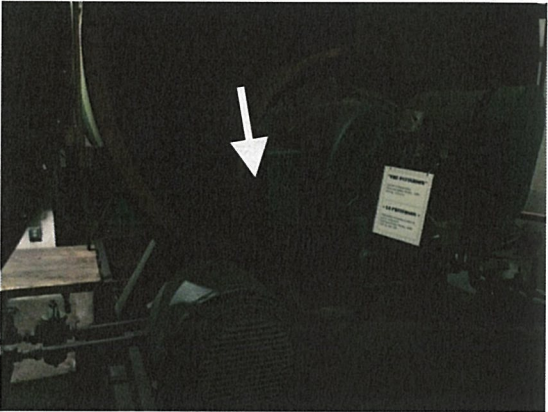
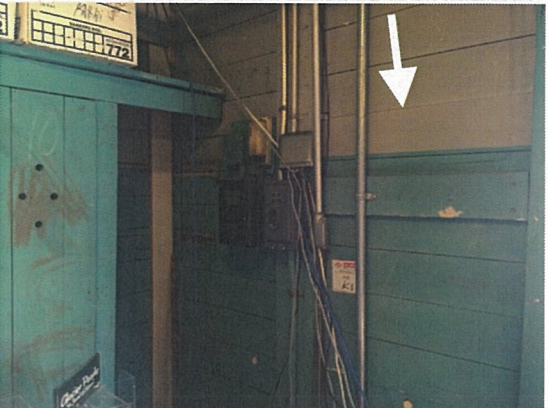
**Table G-1 Summary of Identified LCPs – Cannery Building**

Identified LCP Description	Photo
<p>Black coloured paint on the oil tanks of the Vitamin Oil Shed.</p> <p>This paint was observed to be in good condition (minimal bubbling, flaking or peeling).</p>	
<p>Grey coloured paint on the north interior wall of the Boiler Room.</p> <p>This paint was observed to be in good condition (minimal bubbling, flaking or peeling).</p>	
<p>Grey coloured paint on the staircase of the Boiler Room.</p> <p>This paint was observed to be in good condition (minimal bubbling, flaking or peeling).</p>	

## HAZARDOUS BUILDING MATERIALS ASSESSMENT

Appendix G Summary of Identified LCPs  
 March 24, 2016

**Table G-1 Summary of Identified LCPs – Cannery Building**

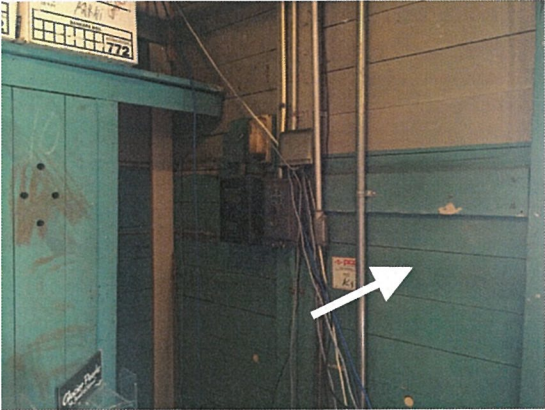

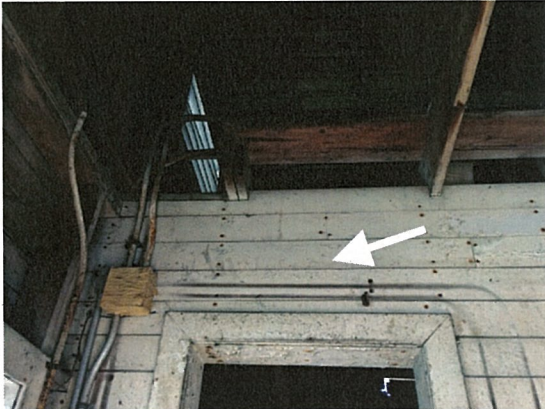
Identified LCP Description	Photo
<p>Black coloured paint on the Tea Kettle Boiler of the Boiler Room.</p> <p>This paint was observed to be in good condition (minimal bubbling, flaking or peeling).</p>	 <p>A photograph of a boiler room. A white arrow points to a black-painted boiler. The room is dimly lit with overhead lights. A red sign with white text is visible on the right wall.</p>
<p>Green coloured paint on the Patterson Boiler of the Boiler Room.</p> <p>This paint was observed to be in good condition (minimal bubbling, flaking or peeling).</p>	 <p>A photograph of a boiler. A white arrow points to a green-painted boiler. The boiler is dark and has some pipes and a label attached to it.</p>
<p>Grey coloured paint on the interior walls of the west staff room in the East Wing.</p> <p>This paint was observed to be in good condition (minimal bubbling, flaking or peeling).</p>	 <p>A photograph of a staff room. A white arrow points to a grey-painted wall. The room has teal-colored lockers and pipes. A sign with the number '172' is visible on the wall.</p>



# HAZARDOUS BUILDING MATERIALS ASSESSMENT

Appendix G Summary of Identified LCPs  
 March 24, 2016


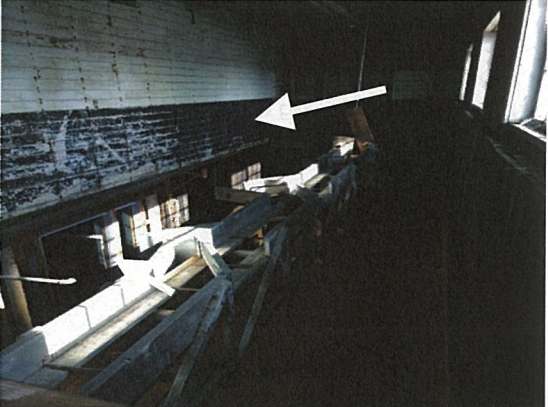

**Table G-1 Summary of Identified LCPs – Cannery Building**

Identified LCP Description	Photo
<p>Teal coloured paint on the interior walls of the west staff room in the East Wing.</p> <p>This paint was observed to be in good condition (minimal bubbling, flaking or peeling).</p>	
<p>White coloured paint on the walls of the East Wing office.</p> <p>This paint was observed to be in good condition (minimal bubbling, flaking or peeling).</p>	<p>No Photo.</p>
<p>Cream coloured paint on the interior walls of the loft level in the East Wing.</p> <p>This paint was observed to be in good condition (minimal bubbling, flaking or peeling).</p>	
<p>Cream coloured paint on interior walls of the upper level Ice House.</p> <p>This paint was observed to be in good condition (minimal bubbling, flaking or peeling).</p>	

# HAZARDOUS BUILDING MATERIALS ASSESSMENT

Appendix G Summary of Identified LCPs  
 March 24, 2016

**Table G-1 Summary of Identified LCPs – Cannery Building**



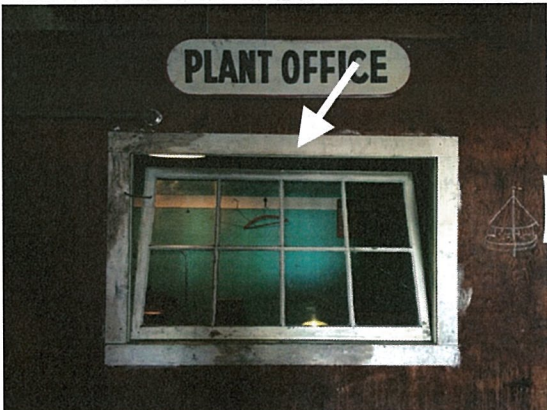
Identified LCP Description	Photo
<p>Red coloured paint on switch boxes on the upper level of the Ice House.</p> <p>This paint was observed to be in poor condition (flaking or peeling).</p>	
<p>Black coloured paint on interior walls of the upper level Ice House.</p> <p>This paint was observed to be in good condition (minimal bubbling, flaking or peeling).</p>	
<p>White coloured paint on the interior wood columns throughout.</p> <p>This paint was observed to be in good condition (minimal bubbling, flaking or peeling).</p>	



# HAZARDOUS BUILDING MATERIALS ASSESSMENT

Appendix G Summary of Identified LCPs  
 March 24, 2016


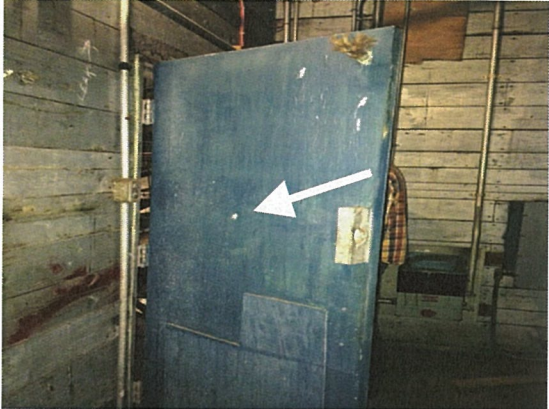
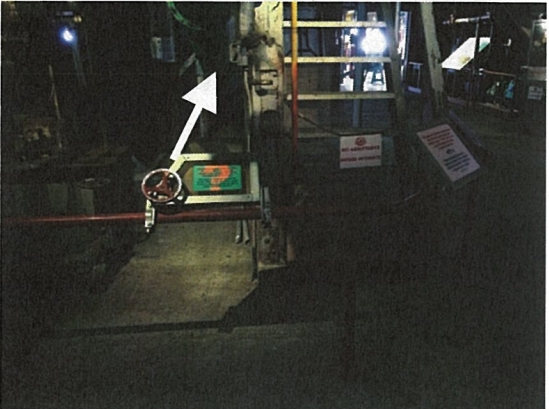
**Table G-1 Summary of Identified LCPs – Cannery Building**

Identified LCP Description	Photo
<p>Teal coloured paint on the door of the Plant Office.                      This paint was observed to be in good condition (minimal bubbling, flaking or peeling).</p>	
<p>Silver coloured paint on the walls of the loft level Electrical Room.                      This paint was observed to be in good condition (minimal bubbling, flaking or peeling).</p>	
<p>White coloured paint on the window trims of the Plant Office.                      These paints were observed to be in good condition (minimal bubbling, flaking or peeling).</p>	

# HAZARDOUS BUILDING MATERIALS ASSESSMENT

Appendix G Summary of Identified LCPs  
March 24, 2016

**Table G-1 Summary of Identified LCPs – Cannery Building**



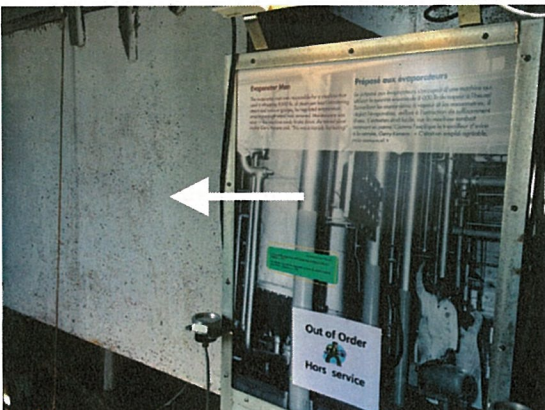
Identified LCP Description	Photo
<p>White coloured paint on wood panel walls throughout.</p> <p>These paints were observed to be in good condition (minimal bubbling, flaking or peeling).</p>	 A photograph showing the interior of a building with wood panel walls. A white arrow points to a section of the wall where white paint has been applied. The ceiling and other parts of the wall are made of natural wood.
<p>Blue coloured paint on the door of the loft level Electrical Room.</p> <p>This paint was observed to be in good condition (minimal bubbling, flaking or peeling).</p>	 A photograph of a blue-painted door set within a wood-paneled wall. A white arrow points to the blue paint on the door. The surrounding walls are made of light-colored wood.
<p>Teal coloured paint on the chute in the Reduction Annex.</p> <p>This paint was observed to be in good condition (minimal bubbling, flaking or peeling).</p>	 A photograph of a teal-colored chute or pipe in a dark, industrial setting. A white arrow points to the teal paint on the chute. The background is mostly black with some structural elements visible.



# HAZARDOUS BUILDING MATERIALS ASSESSMENT

Appendix G Summary of Identified LCPs  
 March 24, 2016

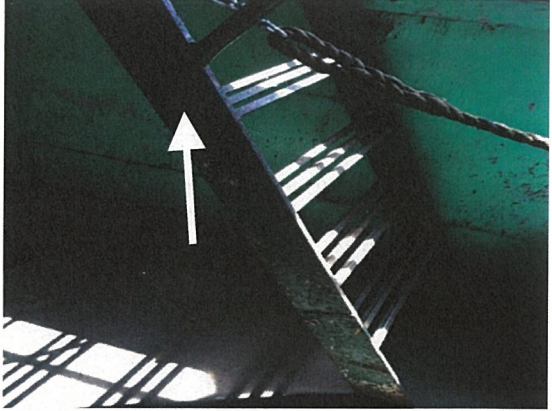
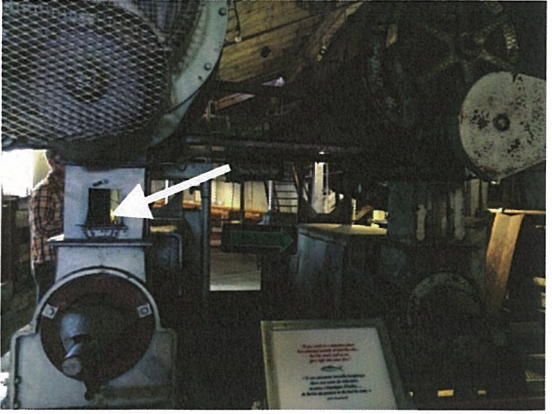
**Table G-1 Summary of Identified LCPs – Cannery Building**

Identified LCP Description	Photo
<p>Green coloured paint on the Evaporator.                      This paint was observed to be in good condition (minimal bubbling, flaking or peeling).</p>	
<p>Yellow coloured paint on the Evaporator.                      This paint was observed to be in good condition (minimal bubbling, flaking or peeling).</p>	
<p>Silver coloured paint on the Evaporator.                      This paint was observed to be in good condition (minimal bubbling, flaking or peeling).</p>	

## HAZARDOUS BUILDING MATERIALS ASSESSMENT

Appendix G Summary of Identified LCPs  
March 24, 2016

**Table G-1 Summary of Identified LCPs – Cannery Building**



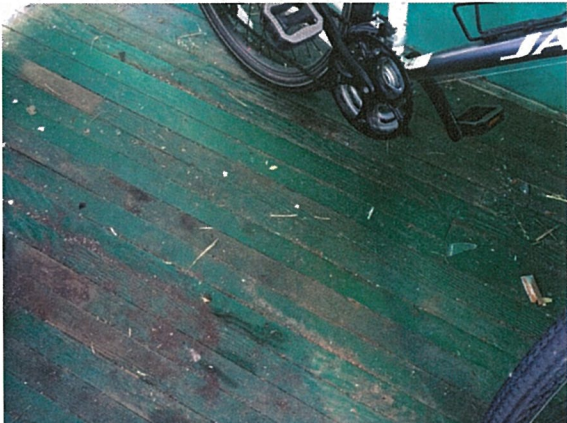
Identified LCP Description	Photo
<p>Dark green coloured paint on the stairs of the Evaporator Room.</p> <p>This paint was observed to be in good condition (minimal bubbling, flaking or peeling).</p>	
<p>Silver coloured paint on the press.</p> <p>This paint was observed to be in good condition (minimal bubbling, flaking or peeling).</p>	



## HAZARDOUS BUILDING MATERIALS ASSESSMENT

Appendix G Summary of Identified LCPs  
 March 24, 2016

**Table G-2 Summary of Identified LCPs – Watchman’s Shed**




Identified LCP Description	Photo
<p>Purple coloured paint on exterior trim (previously identified, a new coat of Red paint was observed during the current assessment, however, unless paint was completely removed prior to repainting then this application should still be considered an LCP).</p> <p>This paint was observed to be in good condition during the current assessment (minimal bubbling, flaking or peeling).</p>	
<p>Teal coloured paint on the interior walls.</p> <p>This paint was observed to be in good condition (minimal bubbling, flaking or peeling).</p>	
<p>Green coloured paint on the floor.</p> <p>This paint was observed to be in good condition (minimal bubbling, flaking or peeling).</p>	



## HAZARDOUS BUILDING MATERIALS ASSESSMENT

Appendix G Summary of Identified LCPs  
March 24, 2016

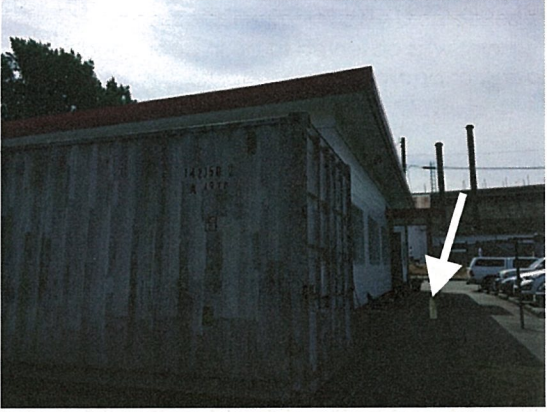
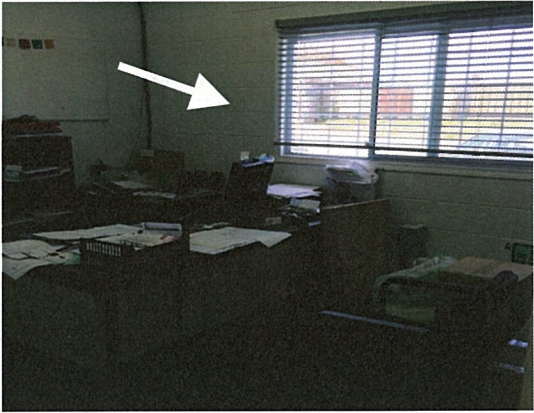
**Table G-3 Summary of Identified LCPs – Tank Farm**

Identified LCP Description	Photo
<p>Red coloured paint on the pipes. This paint was observed to be in poor condition (flaking or peeling).</p>	
<p>Grey coloured paint on tanks. This paint was observed to be in good condition (minimal bubbling, flaking or peeling).</p>	
<p>Blue coloured paint on pumps. This paint was observed to be in poor condition (flaking or peeling).</p>	

# HAZARDOUS BUILDING MATERIALS ASSESSMENT

Appendix G Summary of Identified LCPs  
March 24, 2016


**Table G-4 Summary of Identified LCPs – Administrative Building**

Identified LCP Description	Photo
<p>Yellow coloured paint on the curb on the east of the building.</p> <p>This paint was observed to be in good condition (minimal bubbling, flaking or peeling).</p>	 A photograph showing the exterior of a building with a white curb. A white arrow points to the curb area. The building has a dark roof and some windows. The sky is overcast.
<p>White coloured paint on the interior walls throughout.</p> <p>This paint was observed to be in good condition (minimal bubbling, flaking or peeling).</p>	 A photograph showing the interior of an office. The walls are white. A white arrow points to a wall. There are desks, chairs, and a window with blinds in the background.

## HAZARDOUS BUILDING MATERIALS ASSESSMENT

Appendix G Summary of Identified LCPs  
 March 24, 2016

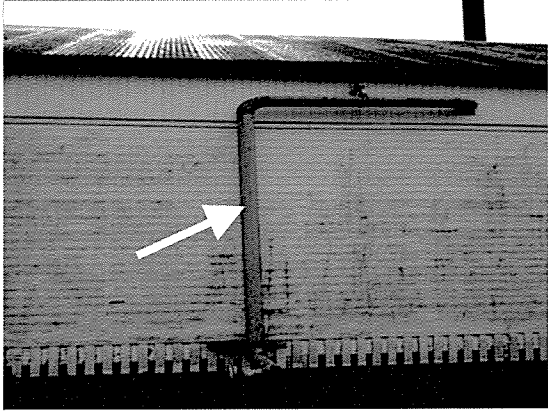
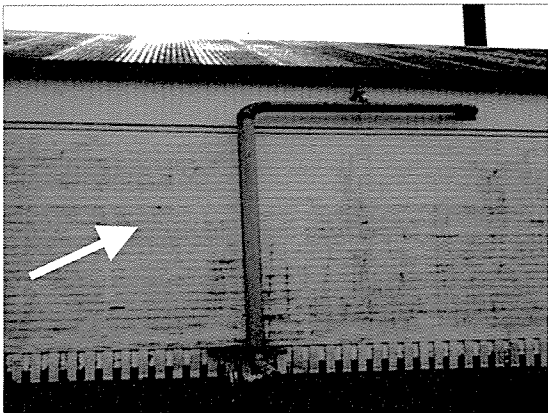
**Table G-5 Summary of Identified LCPs – Lead Foundry**

Identified LCP Description	Photo
<p>Purple coloured paint on exterior trim (previously identified, a new coat of Red paint was observed during the current assessment, however, unless paint was completely removed prior to repainting then this application should still be considered an LCP).</p> <p>This paint was observed to be in good condition during the current assessment (minimal bubbling, flaking or peeling).</p>	
<p>White coloured paint on the interior walls of the Lead Foundry.</p> <p>This paint was observed to be in good condition (minimal bubbling, flaking or peeling).</p>	<p>No Photo.</p>

# HAZARDOUS BUILDING MATERIALS ASSESSMENT

Appendix G Summary of Identified LCPs  
March 24, 2016

**Table G-6 Summary of Identified LCPs – Oil Drum Storage**

Identified LCP Description	Photo
<p>Yellow coloured paint on mechanical pipe on the north exterior (previously identified). This paint was observed to be in good condition (minimal bubbling, flaking or peeling).</p>	
<p>White coloured paint on exterior walls (previously identified). This paint was observed to be in good condition (minimal bubbling, flaking or peeling).</p>	
<p>White coloured paint on the interior trim of the garage. This paint was observed to be in good condition (minimal bubbling, flaking or peeling).</p>	No Photo.





## HAZARDOUS BUILDING MATERIALS ASSESSMENT

Appendix H Laboratory Analytical Report—Mould: Bulk Material  
March 24, 2016

# Appendix H LABORATORY ANALYTICAL REPORT—MOULD: BULK MATERIAL







## RESULTS OF LABORATORY ANALYSES:

## JOB NO. 25137.00

<b>To:</b>	Steve Chou	<b>Date of report:</b>	2015/07/29
<b>Company:</b>	Stantec Consulting Ltd. - Burnaby, BC	<b>Date of sampling:</b>	2015/07/13
<b>Client Project:</b>	123220330.300.100 / Gulf of Georgia Cannery	<b>Analyst:</b>	Susan Du
<b>Client Address:</b>	500-4730 Kingsway, Burnaby, BC V5H 0C6	<b>Date Received:</b>	2015/07/22

<b>BULK / TAPELIFT / BIOTAPE SAMPLE NO.:</b>	EW-MS-01	-	-	-	-	-
<b>Location:</b>	East Wing - Staff Room Locker (west)					
<b>Serial #:</b>	N/A					
<b>Expiry date:</b>	N/A					
<b>FUNGAL IDENTIFICATION:<sup>a</sup></b>	<b>ELEMENTS:</b>	<b>MICROSCOPIC OBSERVATIONS<sup>b</sup> (RATING<sup>c</sup>):</b>				
hyphal fragments, pigmented	2+					
<b>OTHER OBSERVATIONS:</b>						
background rating	2+					
<b>FUNGAL GROWTH INDICATED?<sup>d</sup>:</b>	Y					

AIHA LAP, LLC LAB NO: 171117

Samples were received in satisfactory condition and tested in accordance with SOP 5.4.1.1.3. These results relate only to the samples tested.

<sup>a</sup> NOS = not otherwise specified.

<sup>b</sup> Mounted in lactofuchsin / lactic acid, or other medium as required, with 50-100 fields examined in bright field microscopy at 400x magnification.

<sup>c</sup> - = not detected; tr = 10<sup>0</sup> - 10<sup>1</sup> elements in total; 1+ = 10<sup>0</sup> - 10<sup>1</sup> elements in each of ~25% fields; 2+ = 10<sup>1</sup> - 10<sup>2</sup> elements in each of ~50% fields; 3+ = 10<sup>2</sup> - 10<sup>3</sup> elements in each of ~75% fields; 4+ => 75% fields obscured.

<sup>d</sup> Possibility of fungal growth *in situ* based on microscopic observations; Y = yes; N = no; ? = ambiguous. For explanation please refer to the final page of this report.

### END OF REPORT

Examined By

Susan Du, MSc

Analyst

Released By



Mike Saleh, MHS

Analyst





RESULTS OF LABORATORY ANALYSES:

JOB NO. 25137.00

To:	Steve Chou	Date of report:	2015/07/29
Company:	Stantec Consulting Ltd. - Burnaby, BC	Date of sampling:	2015/07/13
Client Project:	123220330.300.100 / Gulf of Georgia Cannery	Analyst:	Susan Du
Client Address:	500-4730 Kingsway, Burnaby, BC V5H 0C6	Date Received:	2015/07/22

**Guidance on the interpretation of microscopic findings** Samples of bulk materials as well as tape lift samples from potentially contaminated surfaces may be examined microscopically to assess the potential of these materials to be supporting fungal growth and serving as indoor fungal amplification sites. Guidelines on indoor microbial contamination proposed by Health Canada (HC. 1995. Indoor air quality in office buildings: A technical guide. Federal-Provincial Advisory Committee on Environmental and Occupational Health. Ottawa: Environmental Health Directorate 93-EHD-166 rev.) state unambiguously that indoor, active fungal growth sites are unacceptable regardless of the extent to which these amplifiers impact on the indoor airborne spore-load. Fungal spores are commonly borne on air currents and settle on flat surfaces as a matter of course. Thus, the observation of fungal spores alone is insufficient to characterize a specimen as a growth site. This judgment primarily requires the microscopic visualization of fungal filaments ("hyphae", or *en masse*, "mycelia"). Additionally, the identification of different kinds of fungi usually requires the observation of spores (e.g. conidia, ascospores, etc.) along with the organs responsible for their production (e.g. conidiophores, ascomata, etc.). However, the latter rarely persist long after the spores have been produced, making definitive identification difficult or impossible in aged specimens. The rating system used by Sporometrics to score the frequency of structures observed microscopically is based on a 5-point assessment of 50-100 microscopic fields, usually taken at 400 x magnification. This system uses the following rating criteria:

Descriptor	Criteria (based on 50-100 fields)	Interpretation of growth <i>in situ</i> according to observations:	
		Spores alone	Spores and spore-bearing structures or mycelia
tr	10 <sup>0</sup> -10 <sup>1</sup> elements in total	growth <b>not</b> indicated	growth <b>not</b> indicated
1+	10 <sup>0</sup> -10 <sup>1</sup> elements per ~25% fields	unclear	growth indicated
2+	10 <sup>1</sup> -10 <sup>2</sup> elements per ~50% fields	growth indicated	growth indicated
3+	10 <sup>2</sup> -10 <sup>3</sup> elements per ~75% fields	growth indicated	growth indicated
4+	> 75% fields obscured by elements	growth indicated	growth indicated



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November 25<sup>th</sup>, 2016  
File: 14369  
Rev: 01  
PO: 700364619

Attention: Tom Dunphy

**Re: Geotechnical Recommendations – Addition to Gulf of Georgia Cannery Admin. Building  
12138 Fourth Avenue, Richmond, BC**

This letter provides our geotechnical recommendations for the proposed additions to the existing building, Gulf of Georgia Administration Building. Based on the drawings, prepared by RDH Building Science Inc., (their Project No. R.060702.001, dated August 19, 2016), the proposed addition includes a new canopy along the existing north and west exterior walls and concrete slabs below the canopy.

Our geotechnical recommendations presented below for the anticipated additions rely on our anticipated subgrade conditions in this area. Based on our investigation in this area, the subsurface conditions are assumed to consist of existing granular fill extending up to 2 m below the current grade, overlying native soils. The native soils generally consist of 3 m of firm silt to sandy silt, overlying clean sand to approximately 25 to 30 m below the current grade. The upper portion of the clean sand is considered to be liquefiable. Groundwater is anticipated at a depth of 1.5 m below the current grade. Due to the proximity to Fraser River, the groundwater level is tidal.

Based on the anticipated subsurface conditions, new foundations supporting the new canopy are expected to be placed on existing granular fill. Our geotechnical recommendations are followed below.

1. Foundation & Bearing Pressure Recommendations

We recommend that foundations placed on the granular fill can be designed using a serviceability limit state (SLS) bearing pressure of 75 kPa, and an ultimate limit state (ULS) bearing pressure of 150 kPa for transient loading such as those induced by wind or earthquakes.

For foundations designed as recommended above, we expect that settlements should be limited to less than 25 mm total and 20 mm over 10 m differential.

Irrespective of specified bearing pressures, foundations should not be less than 450 mm in width for strip foundations and not less than 600 mm in width for square or rectangular foundations. Foundations should also be buried a minimum of 450 mm below the surface for frost protection.

Foundation subgrade must be reviewed by GeoPacific prior to foundation construction.

2. Seismic Site Class

As noted above, the upper portion of the clean sand is considered prone to liquefaction or strain softening during cyclic loading caused by large earthquakes defined in the 2015 National Building Code of Canada (NBC 2015).



A Fa and Fv for structural assessment can be taken a value equivalent to Site Class E in accordance with the 2015 NBC, assuming a structural period of the canopy is less than 1.0 second.

### 3. Slab-on-Grade Preparation Recommendation

The floor slabs should be underlain by a minimum of 150 mm of river sand or 19 mm clear crushed gravel fill. Under slab drains are not required beneath the floor slab constructed below the new canopy.

The under slab fill should be compacted to a minimum of 98% of the ASTM D698 (Standard Proctor) maximum dry density at a moisture content that is within 2% of optimum for compaction. Any fill materials proposed for use shall have a sieve analysis and standard proctor performed to ensure they are suitable as structural fill.

Exposed subgrade must be reviewed by GeoPacific prior to any fill placement, and nuclear density testing should be carried out by GeoPacific on the under slab fill.

### 4. Construction Considerations

Any temporary excavation parallel to the existing building foundation should have a 0.5 m horizontal bench from the edge of the existing foundation, then excavation can be sloped at 1:1 (H:V) to desired depths. Excavation below the groundwater level may require to be flatter.

GeoPacific will provide detailed recommendations, and review temporary excavations in the vicinity of the existing foundations once the construction commences.

We are pleased to be of assistance to you on this project. If you would like further details or require clarification, please do not hesitate to contact us.

For:  
**GeoPacific Consultants Ltd.**

Reviewed by:



NOV 25 2016

Kazunori Fujita, B.Sc.  
Project Manager

Matt Kokan, M.A.Sc., P.Eng.  
Principal

#### Distribution List:

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Shahzad Pedram, Building Science Engineer – spedram@rdg.com