



# Public Works and Government Services Canada

Requisition No:  F1700-174255

SPECIFICATIONS  
for

**Kitsilano Coast Guard Station**

**Building Envelope Rehabilitation**

Project No. **9W740**

August 2017

## APPROVED BY:

\_\_\_\_\_  
Regional Manager, AES

\_\_\_\_\_  
Date

\_\_\_\_\_  
Construction Safety Coordinator

\_\_\_\_\_  
Date

## TENDER:

\_\_\_\_\_  
Project Manager

\_\_\_\_\_  
Date



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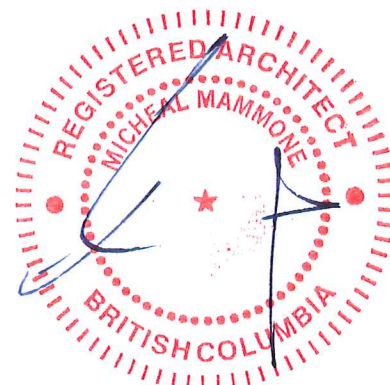
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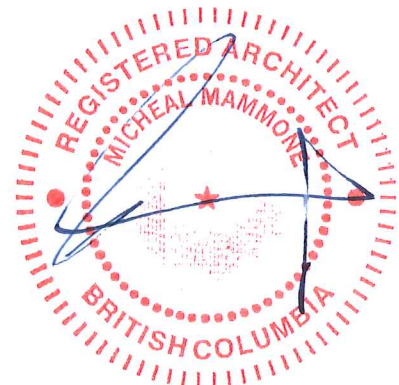
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## **PART 1 GENERAL**

### **1.1 Authorities**

- .1 Perform Work in accordance with the National Building Code of Canada (NBCC), 2015, Canada Occupational Health & Safety regulations, and any other code of provincial or local application provided that in any case of conflict or discrepancy, the more stringent requirements shall apply.
- .2 Meet or exceed requirements of specified standards, codes and referenced documents.
- .3 Having charge of the Kitsilano Coast Guard Station building, substructure and property is the Owner, the Government of Canada (Canada) as managed by the Owner's Representative: Fisheries and Oceans Canada (FOC). The facility is operated by the Canadian Coast Guard (CCG) as a 24-hour emergency rescue & training centre.

### **1.2 Description of Work**

- .1 Work under this Contract comprises the provision of all labour, materials, services and equipment related to the exterior renovations of the Kitsilano Coast Guard Station building, as described in the Contract Documents.

### **1.3 "Green" Requirements**

- .1 Use only environmentally responsible green materials/products with no VOC emissions or minimum VOC emissions of indoor off-gassing contaminants for improved indoor air quality.
- .2 Use materials/products containing highest percentage of recycled and recovered materials practicable – consistent with maintaining cost effective satisfactory levels of competition.
- .3 Adhere to waste reduction requirement for reuse or recycling of waste materials, thus diverting materials from landfill.

### **1.4 Contract Documents**

- .1 The Contract documents, drawings and specifications are intended to complement each other.
- .2 Drawings are, in general, diagrammatic and are intended to indicate the scope and general arrangement of the work.
- .3 Cooperate with pre-purchased and Owner's Representative-supplied equipment and component suppliers in carrying out their respective works and carry out instructions from Owner's Representative.
- .4 Coordinate work with that of pre-purchased and Owner's Representative-supplied equipment and component suppliers. If any part of work under this Contract depends on its proper execution or result upon work of said suppliers, report promptly to Owner's Representative, in writing, any defects which may interfere with proper execution of this Work.

### **1.5 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.

### **1.6 Time of Completion**

- .1 Refer to completion clause in Owner's Representative / Contractor Agreement.

### **1.7 Work Schedule**

- .1 Carry out work as follows:
  - .1 Provide a detailed "phasing bar gantt chart" and a schedule showing, key milestones, anticipated progress stages and final completion of the work within the time period required by the Contract documents.
- .2 Do not change approved Schedule without notifying Owner's Representative.
- .3 Interim reviews of work progress based on work schedule will be conducted as decided by Owner's Representative and schedule updated by Contractor in conjunction with and to approval of Owner's Representative.
- .4 Maintain diary and submit daily reports to Owner's Representative on a "per shift" basis.
- .5 Maintain weekly progress photographs for submission to Owner's Representative when requested.
- .6 The owner shall retain the project schedule float in all circumstances.

### **1.8 Hours of Work**

- .1 Refer to Section 01 14 00 – Work Restrictions.

### **1.9 Codes, Bylaws, Standards**

- .1 Perform work in accordance with the National Building Code of Canada (NBCC), 2015, and other indicated Codes, Construction Standards and/or any other Code or Bylaw of local application.
- .2 Comply with applicable local bylaws, rules and regulations enforced at the location concerned.
- .3 Meet or exceed requirements of Contract documents, specified standards, codes and referenced documents.

- .4 In any case of conflict or discrepancy, the most stringent requirements shall apply.

#### **1.10 Documents Required**

- .1 Maintain one copy each of the following at the job site:
- .1 Contract drawings.
  - .2 Contract specifications.
  - .3 Addenda to Contract documents.
  - .4 Copy of work schedule.
  - .5 Reviewed/approved shop drawings.
  - .6 Change orders.
  - .7 Other modifications to Contract.
  - .8 Field test reports.
  - .9 Reviewed/approved samples.
  - .10 Manufacturer's installation and application instructions.
  - .11 One set of record drawings and specifications for "as-built" purposes.
  - .12 National Building Code of Canada (NBCC), 2010

#### **1.11 Regulatory Requirements**

- .1 Obtain and pay for Certificates, Fees, Licenses and other permits required by regulatory authorities to complete the work. Building & Occupancy Permits are not required.
- .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.

#### **1.12 Contractor's Use of Site**

- .1 Use of site:
- .1 Work on site will be under the control of the Owner;
  - .2 Strict security protocol shall be followed at all times on site. Refer to Section 01 14 00 – Work Restrictions.
  - .3 Assume responsibility for assigned premises for performance of this work.
  - .4 Be responsible for coordination of all work activities on site, including any work of other contractors engaged by the Owner's Representative.
- .2 Perform work in accordance with Contract documents. Ensure work is carried out in accordance with indicated scheduling.
- .3 Do not unreasonably encumber site with material or equipment.
- .4 Execute Work with least possible interference or disturbance to normal use of premises. Make arrangements with Owner's Representative to facilitate work as stated.

- .5 Maintain existing services to in-use facilities.
- .6 Where security is reduced by work, provide temporary means to maintain security as per Owner's Representative's direction and as specified.
- .7 Closures: protect work temporarily until project is completed.

### **1.13 Examination**

- .1 Examine site and be familiar and conversant with existing conditions likely to affect work. Refer also to Section 01 51 00 – Temporary Facilities.

### **1.14 Work Restrictions and Security**

- .1 Refer to Section 01 14 00.

### **1.15 Location of Equipment and Fixtures**

- .1 Location of equipment, fixtures and outlets indicated or specified are to be considered as approximate.
- .2 Locate equipment, fixtures and distribution systems to provide minimum interference and maximum usable space, and in accordance with manufacturer's recommendations for safety, access and maintenance.
- .3 Inform Owner's 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 Owner's Representative and/or as specified.

### **1.16 Cutting and Patching**

- .1 Cut building elements as required to accommodate new work.
- .2 Remove items so shown or specified.
- .3 Do not cut, bore, or sleeve load-bearing members.
- .4 Make cuts with clean, true, smooth edges. Make patches inconspicuous in final assembly.
- .5 Fit work airtight to pipes, sleeves, ducts and conduits.
- .6 Conceal pipes, ducts and wiring in raised floors, wall and ceiling construction of finished areas except where indicated otherwise.
- .7 Patch and make good elements and finishes cut, damaged or disturbed, to Owner's Representatives approval. Match existing material, colour, finish and texture.
- .8 Making good is defined as matching construction and finishing materials and the adjacent surfaces such that there is no visible difference between existing and new surfaces when



viewed from 1.5 metres in ambient light, and includes painting the whole surface to the next change in plane.

### **1.17 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.

### **1.18 Quality of Work**

- .1 Ensure that quality workmanship is performed through use of skilled tradesmen, under supervision of qualified journeyman.
- .2 The workmanship, erection methods and procedures to meet minimum standards set out in the National Building Code of Canada 2015.

### **1.19 Works Coordination**

- .1 Coordinate work of sub-trades:
  - .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 project, 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. And provide a copy of the coordination drawings to Owner's Representative for record.
    - .1 Pay particularly close attention to overhead work above ceilings and within or near to building structural elements.
    - .2 Identify on coordination drawings, building elements, service lines, rough-in points and indicate location services entrance to site.
  - .3 Facilitate meeting and review coordination drawings.
  - .4 Record and Publish meeting minutes of each meeting within in 3 days after the meeting.
  - .5 Plan and coordinate work in such a way to minimize quantity of service line offsets.
  - .6 Submit copy of coordination drawings and meeting minutes to Owner's Representative for information purposes.
- .3 Submit shop drawings and order of prefabricated equipment or 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 spatial 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, cutting, patching and removal or replacement of completed work.
- .3 Ensure that disputes between subcontractors are resolved.
- .5 Owner's Representative is not responsible for, nor accountable for extra costs incurred as a result of Contractor's failure to coordinate Work.
- .6 Maintain efficient and continuous supervision.
- .7 Coordinate and cooperate with institution staff where new work interfaces with active institution equipment and operation.

#### **1.20 Project Meetings**

- .1 Contractor shall arrange project meetings and assume responsibility for setting times and recording and distributing minutes. Schedule project meetings well in advance, as regular, repeating events whenever possible.

#### **1.21 Testing and Inspections**

- .1 Particular requirements for inspection and testing to be carried out by testing service or laboratory approved by the Owner's Representative are specified in individual Sections. Refer also to Section 01 45 00 – Quality Control.
- .2 Building Envelope Verification: undertake Building Envelope performance testing procedures per Section 01 45 00 – Quality Control part 1.4. Use a testing agency as approved by the Consultant.
- .3 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.
  - .3 Testing, adjustment and balancing of mechanical and electrical equipment and systems.
    - .1 Mill tests and certificates of compliance.
    - .2 Tests specified to be carried out by Contractor under the Owner's Representative's supervision.
- .4 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 Owner's Representative may require to verify acceptability of corrected work.
- .5 Contractor shall furnish labour and facilities to:
  - .1 Notify Owner's Representative in advance of planned testing.
- .6 Where materials are specified to be tested, deliver representative samples in required quantity to testing laboratory.

- .7 Pay costs for uncovering and making good work that is covered before required inspection or testing is completed and approved by Owner's Representative.
- .8 The Owner's Representative may require, and pay for, additional inspection and testing services not included in Paragraph 1.20.2 above.
- .9 Provide Owner's Representative with two copies of testing laboratory reports as soon as they are available.

#### **1.22 Hazardous Materials Report**

- .1 Refer to Appendix B – Targeted Hazardous Materials Sampling at 1661 Whyte Ave. (Total Safety 2017)
- .2 Refer to Appendix C – Building Enclosure Assessment Report (RDH 2015)
- .3 Fully conform to the above recommendations and listed regulations.
- .4 Refer to Sections 01 35 43- Environmental Procedures, and 01 74 21 – Waste Management & Disposal.

#### **1.23 As-Built Documents**

- .1 The Contractor shall provide two sets of drawings, two sets of specifications, and two copies of the original AutoCAD files for "as-built" purposes.
- .2 As work progresses, maintain accurate records to show all deviations from the Contract documents.
- .3 Refer to Section 01 78 30 – Closeout Submittals.

#### **1.24 Cleaning**

- .1 Refer to Section 01 74 00 – Cleaning.

#### **1.25 Dust Control**

- .1 Provide temporary dust tight screens or partitions and wet-down roadways to localize dust generating activities, and for protection of workers, finished areas of work and facility staff. Refer also to Section 01 51 00 – Temporary Facilities.
- .2 Maintain and relocate protection until such work is complete.

#### **1.26 Environmental Protection**

- .1 Refer to Sections 01 35 43- Environmental Procedures, and 01 74 21 – Waste Management & Disposal.

#### **1.27 Security Clearances**

- .1 Refer to Section 01 14 00 – Work Restrictions.

**1.28 Maintenance Materials, Special Tools and Spare Parts**

- .1 Specific requirements for maintenance materials, tools and spare parts are specified in individual technical sections of specifications. Refer to Section 01 78 30 – Closeout Submittals.

**1.29 Specialty Engineers**

- .1 Various specifications sections require BC Registered Professional Engineers (“Specialty Engineers”) to prepare, sign and seal shop drawings, submit Letters of Assurance and perform Field Services as required. Payment of Specialty Engineer services shall be included in the cost of the appropriate work.

**1.30 Additional Drawings**

- .1 The Owner’s Representative may furnish additional drawings for clarification. These additional drawings have the same meaning and intent as if they were included with drawings referenced in the Contract documents.

**END OF SECTION**

**Part 1 GENERAL**

**1.1 CONTROL AND AUTHORITY OVER SITE**

- .1 All work on site will be under the control of the Owner, except the areas designated to the Contractor as being under its control.

**1.2 ACCESS AND EGRESS**

- .1 All construction, staff and delivery vehicles accessing the site shall follow procedures as determined by the Owner's Representative.
- .2 There is no on-site vehicle parking. Contractor to make arrangements with the Municipality for any staging or storage areas, parking, hoarding, etc. on public property, as needed for the timely performance of the Work. Any costs arising are to be borne by the Contractor.

**1.3 HOURS OF WORK**

- .1 Schedule work according to Municipal restrictions, with the approval of the Owner's Representative.

**1.4 USE OF SITE AND FACILITIES**

- .1 Execute work with least possible interference or disturbance to normal use and operation of the Owner's adjacent premises. Make arrangements with Owner's Representative to facilitate work as stated.
- .2 Normal use and operation of the Owner's adjacent premises includes the requirement for 24-hour vehicular & pedestrian access, via the designated pathway, from land to the north end of the pier, and attached equipment, gangways, docks and ships so as to sustain full emergency rescue & other Canadian Coast Guard operations. Do not impede access or operations.
- .3 Maintain existing services, including continuous electrical service, to the owner's facilities at and adjacent to the north end of the pier.
- .4 This facility is located above ocean tide-water, and as such is under the jurisdiction of the Fisheries Act & the Species At Risk Act (SARA), as administered by Fisheries & Oceans Canada (FOC). It is the Contractor's responsibility to ensure that all measures to avoid harm under these regulations. Refer to Section 01 35 43 – Environmental Procedures for further details.
- .5 Where security is reduced by work, provide temporary means to maintain security as per Owner's Representative's direction and as specified.
- .6 Closures: protect & secure work temporarily until project is completed.

- .7 Areas under construction must be separated by temporary fencing or hoarding (refer to Section 01 51 00 – Temporary Facilities), and should not utilize any more space in the Contractor's lay-down area than what is absolutely necessary. Refer to 1.2.2 above.
- .8 Any work which impacts the operations, including Exit paths, of the Owner's adjacent premises, specifically the Kitsilano Coast Guard Station outside of the designated construction enclosure, its pier substructure & attachments, and owner's adjacent facilities is to be undertaken only with the prior approval of the Owner's Representative. Obtain said approval 1 week before the work is scheduled, minimum.
- .9 Construction personnel are not allowed to use washrooms in the adjacent buildings. Refer to Section 01 51 00.
- .10 Provide access to laundry facilities and one washroom in the building for intermittent CCG staff use, schedule to be agreed upon with the Owner's Representative at construction start-up.

#### **1.5 NOISE GENERATION**

- .1 Means and procedures of controlling and isolating other excessive or disturbing noise and vibration affecting adjacent occupied areas shall be the responsibility of the Contractor and approved by the Owner's Representative.

#### **1.6 EXISTING SERVICES**

- .1 Where work involves interrupting, breaking into or connecting to existing mechanical or electrical services: give Owner's Representative (1) one week's notice for permission.
- .2 Contractor will be held responsible for damages to facility equipment as the result of service shut-downs.
- .3 Contractor will be held responsible for any and all unscheduled shut-downs of building utilities and services.
- .4 Contractor will not be allowed to connect to User's existing data and communication services for his own use.

#### **1.7 BUILDING SMOKING ENVIRONMENT**

- .1 Comply with smoking restrictions. Smoking is NOT permitted within the buildings, or the site, or within 6 meters of any entrance, open windows or air intakes.

#### **1.8 SECURITY CONTROL**

- .1 The Contractor will have control of access to, and security of the work site. Provide security in cooperation with CCG security procedures. Maintain unimpeded & continuous CCG access to the north end of the pier.

**END OF SECTION**

## PART 1 GENERAL

### 1.1 Approvals

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

### 1.2 General

- .1 This Section specifies general requirements and procedures for the Contractor's submissions of shop drawings, product data, samples and other requested submittals to Owner's Representative for review. Additional specific requirements for submissions are specified in individual technical sections.
- .2 Present shop drawings, product data and samples in Metric dimensions.
- .3 Where items or information is not produced in Imperial dimensions, converted values are acceptable.
- .4 Contractor's responsibility for errors and omissions in submission is not relieved by Owner's Representative's review of submissions.
- .5 Notify Owner's Representative in writing at time of submission, identifying deviations from requirements of Contract documents and stating reasons for deviations.
- .6 Contractor's responsibility for deviations in submission from requirements of Contract documents is not relieved by Owner's Representative's review of submission unless Owner's Representative gives written acceptance of specific deviations.
- .7 Make any changes in submissions which Owner's Representative may require consistent with Contract documents and resubmit as directed by Owner's Representative.
- .8 Notify Owner's Representative in writing, when resubmitting, of any revisions other than those requested by Owner's Representative.
- .9 **Do not proceed with work until relevant submissions are reviewed and approved by the Owner's Representative.**

### 1.3 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 Allow (10) ten working days for Owner's Representative's review of each submission, unless noted otherwise.
- .3 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.
- .4 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.
- .5 Seal of Professional Engineer, registered in British Columbia, for all items so required in the various sections of the specifications.
- .6 Details of appropriate portions of work as applicable:
  - .1 Fabrication.
  - .2 Layout, showing dimensions (including identified field dimensions) and clearances.
  - .3 Setting or erection details.
  - .4 Capacities.
  - .5 Performance characteristics.
  - .6 Standards.
  - .7 Operating weight.
  - .8 Wiring diagrams.
  - .9 Single line and schematic diagrams.
  - .10 Relationship to adjacent work.
- .5 After Owner's Representative's review, distribute copies.

#### **1.4 Shop Drawings**

- .1 Shop drawings: original drawings or modified standard drawings provided by Contractor to illustrate details of portions of work which are specific to project requirements.
- .2 Maximum sheet size: 850 x 1050 mm. (for hard copy submission).
- .3 Submit electronic versions of shop drawings for each requirement requested in the specification sections and/or as requested by the Owner's Representative.
- .4 Cross-reference shop drawing information to applicable portions of the Contract documents.

#### **1.5 Shop Drawings Review**

- .1 Review of shop drawings by the Owner's Representative is for the sole purpose of ascertaining conformance with the general concept.
- .2 This review shall not mean that the Owner's Representative approves the detail design inherent in the shop drawings, responsibility for which shall remain with Contractor submitting same.
- .3 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.
- .4 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 of all sub-trades.



**1.6 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 6 copies of product data.

**1.7 Samples**

- .1 Samples: examples of materials, equipment, quality, finishes and workmanship.
- .2 Where colour, pattern or texture is a criterion, submit a full range of samples.
- .3 **Reviewed and accepted samples will become the standard of workmanship and material against which installed work will be verified.**

**1.8 Progress Schedule**

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

**1.9 Test Results and Inspection Reports**

- .1 Submit in duplicate test results and inspection reports required by specification sections where noted.

END OF SECTION



## **PART 1 GENERAL**

### **1.0 References**

- .1 National Building Code of Canada (NBCC), 2010:
  - .1 Part 8, Safety Measures at Construction and Demolition Sites.
- .2 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 Purpose.
  - .3 CSA-S350-M1980 (R2003) Code of Practice for Safety in Demolition of Structures.
- .3 Province of British Columbia:
  - .1 Workers Compensation Act Part 3 Occupational Health & Safety.
  - .2 Occupational Health and Safety Regulation

### **2.0 Related Sections**

- .1 Refer to the following current NMS sections as required:
  - .1 General Instructions: Section 01 11 55
  - .2 Work Restrictions: Section 01 14 00
  - .3 Submittal Procedures: Section 01 33 00
  - .4 Temporary Facilities: Section 01 51 00
  - .5 Waste Management and Disposal: Section 01 74 21
  - .6 Demolition: Section 02 41 00
  - .7 Sealants: Section 07 90 00
  - .8 Painting and Coating: Section 09 90 00
  - .9 Appendix B – Targeted Hazardous Materials at 1661 Whyte Ave. (Total Safety 2017)
  - .10 Appendix C – Building Enclosure Assessment Report (RDH 2015)

### **3.0 Workers' Compensation Board Coverage**

- .1 Comply fully with Canada occupational health & safety regulations.
- .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.

#### **4.0 Compliance with Regulations**

- .1 The Owner may terminate the Contract, without liability to the Owner, where the Contractor, in the opinion of the Owner, refuses to comply with a requirement Canada occupational health & 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 Canada occupational health and safety regulations.

#### **5.0 Submittals**

- .1 Submit to Owner's Representative submittals listed for review.
- .2 Work affected by submittal shall not proceed until review is complete.
- .3 Submit the following:
  - .1 Health and Safety Plan.
  - .2 Copies of reports or directions issued by federal health and safety inspectors.
  - .3 Copies of incident and accident reports.
  - .4 Complete set of Material Safety Data Sheets (MSDS), and all other documentation required by Workplace Hazardous Materials Information System (WHMIS) requirements.
  - .5 Emergency Procedures.
- .4 The Owner's Representative will review the Contractor's site-specific project Health and Safety Plan and emergency procedures, and provide comments to the Contractor within 2 days after receipt of the plan. Revise the plan as appropriate and resubmit to Owner's Representative for review.
- .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 Owner's Representative.
- .6 Submission of the Health and Safety Plan, and any revised version, to the Owner's Representative is for information and reference purposes only. It shall not:
  - .1 Be construed to imply approval by the Owner's 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.

## **6.0 Responsibility**

- .1 Assume responsibility as the Prime Contractor for work under this project
- .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.

## **7.0 Health and Safety Coordinator**

- .1 The Health and Safety Coordinator must:
  - .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, daily enforcing, and monitoring the site-specific Health and Safety Plan.
  - .3 Be on site during execution of work.

## **8.0 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, or provide security guard, as deemed necessary to protect site against entry.
  - .3 Comply fully with the recommendations and listed regulations of the Hazardous Materials Survey (Total Safety), Appendix B. Provide all abatement documentation as required to the Owner's Representative.

## **9.0 Regulatory Requirements**

- .1 Comply with specified codes, acts, bylaws, standards and regulations to ensure safe operations at site.
- .2 In event of a 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 Owner's Representative will advise on the course of action.

#### **10.0 Work Permits**

- .1 Obtain specialty trade permits related to project before start of work.

#### **11.0 Filing Notice**

- .1 The Contractor is to complete and submit a Notice of Project as required by provincial authorities.
- .2 Provide copies of all notices to the Owner's Representative.

#### **12.0 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 Owner's Representative prior to commencement of work on site.
- .5 Owner's Representative's review: the review of Health and Safety Plan by the Owner shall not relieve the Contractor of responsibility for errors or omissions in final Health and Safety Plan or of responsibility for meeting all requirements of construction and Contract documents.

### **13.0 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 Owner's Representative and site staff.
- .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 that may be affected if the risk extends beyond the workplace.
  - .6 Notify Owner's Representative and site staff.
- .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 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.
- .5 Revise and update emergency procedures as required, and re-submit to the Owner's Representative.

#### **14.0 Hazardous Products**

- .1 Comply with requirements of Workplace Hazardous Materials Information System (WHMIS) regarding use, handling, storage and disposal of hazardous materials, and regarding labeling and provision of Material Safety Data Sheets (MSDS) acceptable to the Owner's Representative and in accordance with the Canada Labour Code.
- .2 Comply with the recommendations in Appendix B - Hazardous Materials Study and regulations listed therein.
- .3 Where use of hazardous and toxic products cannot be avoided:
  - .1 Advise Owner's Representative beforehand of the product(s) intended for use. Submit applicable MSDS and WHMIS documents as per Section 01 33 00 – Submittal Procedures.
  - .2 In conjunction with Owner's Representative, schedule to carry out work during "off hours" when tenants have left the building.
- .4 Provide adequate means of ventilation.

#### **15.0 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 Owner's 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.

#### **16.0 Electrical Lockout**

- .1 Develop, implement and enforce use of established procedures to provide electrical, mechanical, pneumatic, hydraulic, chemical, thermal, or potential energy isolation and 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 Owner's 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 Owner's Representative or by any authorized safety representative.



**17.0 Overloading**

- .1 Ensure no part of work is subjected to a load which will endanger its safety or will cause permanent deformation.

**18.0 Falsework**

- .1 Design and construct falsework in accordance with CSA S269.1-1975 (R2003).

**19.0 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.

**20.0 Confined Spaces**

- .1 Carry out work in confined spaces in compliance with Provincial Occupational Health and Safety regulations.

**21.0 Powder-Actuated Devices**

- .1 Use powder-actuated devices in accordance with ANSI A10.3 only after receipt of written permission from the Owner's Representative.

**22.0 Fire Safety and Hot Work**

- .1 Obtain Owner's 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.

**23.0 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.

**24.0 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, stand pipes and hose systems for any purposes other than fire fighting.
- .3 Be responsible/liable for costs incurred from the fire department, the building Owner's Representative and the tenants, resulting from false alarms.

## **25.0 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 Owner's Representative verbally and in writing.

## **26.0 Posted Documents**

- .1 Post legible versions of the following documents on site:
  - .1 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 Owner's Representative.

**27.0 Meetings**

- .1 Attend health and safety pre-construction meeting and all subsequent meetings called by the Owner's Representative.

**28.0 Correction of Non-Compliance**

- .1 Immediately address health and safety non-compliance issues identified by the Owner's Representative.
- .2 Provide Owner's Representative with written report of action taken to correct non-compliance with health and safety issues identified.
- .3 The Owner's 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



**Part 1            General**

**1.1    RELATED SECTIONS**

- |    |                  |                                |
|----|------------------|--------------------------------|
| .1 | Section 01 33 00 | Submittal Procedures           |
| .2 | Section 01 35 33 | Health and Safety Requirements |
| .3 | Section 01 51 00 | Temporary Facilities           |
| .4 | Section 01 74 21 | Waste Management and Disposal  |

**1.2    DEFINITIONS**

- .1    Environmental Pollution and Damage: presence of chemical, physical, biological elements or agents which adversely affect human health and welfare; unfavourably alter ecological balances of importance to human life; affect other species of importance to humankind; or degrade environment aesthetically, culturally and/or historically.
- .2    Environmental Protection: prevention/control of pollution and habitat or environment disruption during construction. Control of environmental pollution and damage requires consideration of land, water, and air; biological and cultural resources; and includes management of visual aesthetics; noise; solid, chemical, gaseous, and liquid waste; radiant energy and radioactive material as well as other pollutants.
- .3    Fisheries Act: an Act of the Parliament of Canada regulating the protection of fish and fish habitat, under the management of Fisheries & Oceans Canada.
- .4    Species at Risk Act (SARA): an Act of the Parliament of Canada regulating the protection of certain listed at-risk species and their habitat, under the management of Fisheries & Oceans Canada.

**1.3    SUBMITTALS**

- .1    Submittals: in accordance with Section 01 33 00 – Submittal Procedures.
- .2    Prior to commencing construction activities or delivery of materials to site, submit Environmental Protection Plan for review and approval by Owner’s Representative. Environmental Protection Plan is to present comprehensive overview of known or potential environmental issues which must be addressed during construction.
- .3    Address topics at level of detail commensurate with environmental issue and required construction tasks.
- .4    Environmental protection plan: include:
  - .1    Name[s] of person[s] responsible for ensuring adherence to Environmental Protection Plan.
  - .2    Name[s] and qualifications of person[s] responsible for manifesting hazardous waste to be removed from site.

- .3 Name[s] and qualifications of person[s] responsible for training site personnel.

#### **1.4 FIRES**

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

#### **1.5 DISPOSAL OF WASTES**

- .1 Do not bury rubbish and waste materials on site.
- .2 Do not dispose of waste or volatile materials, such as mineral spirits, oil or paint thinner into waterways, storm or sanitary sewers.

#### **1.6 SITE CLEARING AND PLANT PROTECTION**

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

#### **1.7 WORK ADJACENT TO WATERWAYS**

- .1 It is the responsibility of the Contractor to follow all regulations under the Fisheries Act and the Species at Risk Act.
- .2 Obtain review & clearance for the work under this project from:  
Triage & Planning Unit, Fisheries Protection Program  
Ecosystems Management Branch  
Fisheries & Oceans Canada  
200 – 401 Burrard Street  
Vancouver, B.C. V6C 3S4  
Telephone: toll free 1-866-845-6776  
Email: [ReferralsPacific@dfo-mpo.gc.ca](mailto:ReferralsPacific@dfo-mpo.gc.ca)
- .3 Undertake all mitigation measures designated as required for the performance of the work as a result of the above review by FOC.
- .4 Do not operate construction equipment in waterways.
- .5 Do not use waterway beds for borrow material without Owner's Representative's approval.

- .6 Do not dump excavated fill, waste material or debris in waterways.
- .7 Design and construct temporary crossings to minimize erosion to waterways.
- .8 Do not skid logs or construction materials across waterways.
- .9 Avoid indicated spawning beds when constructing temporary crossings of waterways.
- .10 Do not blast under water or within 100m of indicated spawning beds.

### **1.8 POLLUTION CONTROL**

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

### **1.9 NOTIFICATION**

- .1 Owner's Representative will notify Contractor in writing of observed noncompliance with Federal, Provincial or Municipal environmental laws or regulations, permits, and other elements of Contractor's Environmental Protection plan.
- .2 Contractor: after receipt of such notice, inform Owner's Representative(s) of proposed corrective action and take such action for approval by Owner's Representative(s).
- .3 Owner's Representative(s) 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.

**END OF SECTION**







- b. Water penetration resistance test pressure when tested in accordance with ASTM Standard E1105: 300Pa, when subjected to 5 cycles of 5 min.
  - c. Testing will be conducted and equipment will be provided by the approved testing agency.
  - d. Contractor will be responsible for the construction of the test chamber(s), installation of the systems to be tested, provision of adequate water pressure/flow, and access equipment.
2. Air Leakage Testing: testing agency shall conduct quantitative testing of the airtightness of the air barrier system to meet:
1. 2.0 L/s·m<sup>2</sup> of vertical building enclosure area when tested at 75 Pa in accordance with ASTM Standard E779, using both pressurization and depressurization.
  2. In addition to the quantitative airtightness testing, the testing agency shall conduct supplemental qualitative airtightness of the air barrier system in accordance with ASTM Standard E1186 using the thermographic scanning method and smoke tracer method to identify any localized areas of air leakage. Any deficiency items identified by the testing agency to be corrected by Contractor.
  3. The Contractor will perform all building preparation work, as directed by the testing agency, including but not limited to temporarily sealing all HVAC intakes/exhausts, propping open all interior doors, and priming all plumbing traps.

## 1.5 INSPECTION

- .1 Allow Owner's 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 Owner's 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 Owner's Representative may order any 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, Owner's Representative shall pay cost of examination and replacement.

## 1.6 INDEPENDENT INSPECTION AGENCIES

- .1 Independent Inspection/Testing Agencies, approved by the Owner's Representative, shall be engaged by the Contractor for purpose of inspecting and/or testing portions of Work. Cost of such services shall be included in the contract price. Said inspections, testing and quality assurance shall include, but not be limited to the following:
  - .1 Hazardous material survey, report and continual inspection and monitoring.
  - .2 Concrete mix design and testing.
  - .3 Mill tests for steel.
  - .4 Structural and reinforcing steel inspection.

- .5 Roofing systems inspection and testing.
- .6 Painting and coating inspection.
- .7 Mechanical systems inspection, testing and balancing.
- .8 Electrical systems inspection and testing.
- .9 Inspection and testing of all materials, components and systems as called for specifically in each specification section and as required.
- .2 Submit for approval by Owner's Representative names of proposed Independent Inspection/Testing Agencies
- .3 Provide equipment required for executing inspection and testing by appointed agencies.
- .4 Employment of inspection/testing agencies does not relax responsibility to perform Work in accordance with Contract Documents.
- .5 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 Owner's Representative at no cost to the Owner. Pay costs for retesting and re-inspection.

#### **1.7 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.

#### **1.8 PROCEDURES**

- .1 Notify appropriate agency and Owner's 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 an orderly sequence so as not to cause delay 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.

#### **1.9 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 Owner's 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 Owner's Representative it is not expedient to correct defective Work or Work not performed in accordance with Contract Documents, Owner's Representative may deduct from Contract Price difference in value between Work performed and that called for by Contract Documents, amount of which shall be determined by Owner's Representative.

#### **1.10 REPORTS**

- .1 Submit electronic copies of inspection and test reports to Owner's Representative.
- .2 Provide copies to Subcontractor of work being inspected or tested manufacturer or fabricator of material being inspected or tested.

**1.11 TESTS AND MIX DESIGNS**

- .1 Contractor shall furnish test results and mix designs as may be requested.
- .2 The cost of tests and mix designs beyond those called for in Contract Documents or beyond those required by law of Place of Work shall be appraised by Owner's Representative and may be authorized as recoverable.

**1.12 MOCK-UPS**

- .1 Prepare mock-ups for Work specifically requested in specifications. Include for Work of all Sections required to provide mock-ups.
- .2 Construct in all locations acceptable to Owner's Representative.
- .3 Prepare mock-ups for Owner's Representative's review with reasonable promptness and in an orderly sequence, so as not to cause any delay in Work.
- .4 Failure to prepare mock-ups in ample time is not considered sufficient reason for an extension of Contract Time and no claim for extension by reason of such default will be allowed.
- .5 If requested, Owner's Representative will assist in preparing a schedule fixing dates for preparation.
- .6 Remove mock-up at conclusion of Work or when acceptable to Owner's Representative.
- .7 Except where otherwise specified, mock-ups may remain as part of Work.
- .8 Specification section identifies whether mock-up may remain as part of Work or if it is to be removed and when.
- .9 Mockups shall be constructed of actual materials to be used in the work unless otherwise approved by the Owner's Representative.

**1.13 MILL TESTS**

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

**1.14 EQUIPMENT AND SYSTEMS**

- .1 Submit adjustment and balancing reports for mechanical, electrical and building equipment systems.

**END OF SECTION**

**Part 1 GENERAL**

**1.1 Temporary Facilities Plan**

- .1 In concert with, and approval of, the Owner's Representative, the Contractor shall prepare a Temporary Facilities Plan (sufficient for the timely performance of the Work, and coordinated with the project schedule) indicating locations and extents of the following:
  - .1 Temporary continuous emergency vehicle access routing.
  - .2 Contractor's access, lay-down and marshalling areas;
  - .3 Project office, toilets, first aid station, debris bins, storage enclosures and other Temporary Facilities;
  - .4 Contractors' and staff parking;
  - .5 Temporary hoarding and barriers;
  - .6 Temporary public traffic routing, controls and diversion, as required for deliveries etc, to municipal standards;
  - .7 Project construction & safety signage;
  - .8 Make arrangements with the municipality and pay for the use of public property, streets and/or sidewalks for the placement of Temporary Facilities needed for the timely performance of the work;
- .2 No work on site shall proceed until the Temporary Facilities Plan is approved by the Owner's Representative.
- .3 Refer to the Architectural Site Plan for indications of site-specific restrictions and requirements for the Owners access and continued operations adjacent to the work area, and to contractor access to the site and parking.

**1.2 Access & Delivery**

- .1 Refer to Section 01 14 00 – Work Restrictions.
- .2 Comply with the Temporary Facilities Plan.
- .3 Provide and maintain access roads, sidewalk crossings, ramps and construction runways as may be required for access to work.
- .4 Make good damage to local roadways and paved areas used for construction access to work site.

**1.3 Public Traffic Flow**

- .1 Provide and maintain competent signal flag operators, traffic signals, barricades and flares, lights, or lanterns as required to perform Work and protect public.

**1.4 Fire and Emergency Vehicle Routes**

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

### **1.5 Storage and Lay-Down Area**

- .1 Confine activities to the area of the site, except where space restrictions require the use of off-site storage, or other project needs. Do not endanger or interfere with operations, existing facilities nor utilities on site. Refer also to Section 01 14 00.
- .2 Contractors' storage and lay-down facilities shall be confined to that area indicated on the Temporary Facilities Plan, and confined by the following Contractor provided means:
  - .1 Separate lay-down area from vehicular traffic by means of a combination of temporary concrete roadway barriers, and/or temporary construction type fencing, and/or other enclosures secured to the pavement with screws or bolts.
  - .2 Non-traffic-exposed sides of the areas shall be contained by temporary construction type fencing screwed or bolted to the pavement.
  - .3 Provide access gates, of type as approved by Owner's Representative, where indicated on Temporary Facilities Plan.
  - .4 At completion of project, remove concrete barriers, fencing, gates and make good to pavement and other affected elements.
- .3 Storage space is limited to lay-down area. Should more storage be required, Contractor shall provide off site.
- .4 Do not load or permit to load any part of Work with weight or force that will endanger Work or existing structure or elements.
- .5 Contractor(s) shall provide construction trailers for use as site office and storage located in lay-down area.
- .6 Locate and maintain in clean, orderly and safe condition. Remove and make good site at Project completion. Provide first aid facilities in strict accordance with WCB requirements. Locate temporary facilities in compliance with Temporary Facilities Plan and as directed by Owner's Representative.

### **1.6 Temporary Construction Power**

- .1 Provide and pay for temporary power during construction, if required by the scope of work. Contractor shall also be responsible for connections to power source and for continued maintenance of same for the duration of the project, all in accordance with the Facility's Policy and BC Hydro.
- .2 Electrical power and lighting installed under this contract may be used for temporary construction purposes, provided that guarantees are not affected thereby and electrical components used for temporary power are replaced when damaged. Charges for said power shall be paid for by the Contractor.
- .3 Replace lighting bulbs/tubes used for more than three months or provide replacement bulbs/tubes and hand over to Owner's Representative.

### **1.7 Water Supply**

- .1 Contractor shall make arrangements for water supply and be responsible for making all connections and making good at project completion.

### **1.8 Sanitary Facilities**

- .1 Contractor shall provide temporary portable toilets for construction workers on site. Locate in lay-down area and maintain in a sanitary, safe and secure manner. Remove from site and make good at completion of Project.

### **1.9 Temporary Heating and Ventilation**

- .1 Provide temporary heating required during construction period, and when the base building heating system is non-operational, including attendance, maintenance and fuel.
- .2 Maintain working temperatures and ventilation rates as required in writing by the manufacturers of the various materials, coatings and systems being employed on the Project.
- .3 Construction heaters used inside any buildings must be vented to outside or be flameless type. Solid fuel salamanders are not permitted.
- .4 Provide temporary heat and ventilation for construction as required to:
  - .1 Facilitate progress of Work.
  - .2 Protect Work and products against dampness and cold.
  - .3 Concrete curing.
  - .4 Prevent moisture condensation on surfaces.
  - .5 Provide ambient temperatures and humidity levels for storage, installation and curing of materials.
  - .6 Provide adequate ventilation to meet health regulations for safe working environment.

### **1.10 Contractor's Parking**

- .1 Contractors' and construction staff parking shall be limited to those areas indicated on the Temporary Facilities Plan.

### **1.11 Dewatering**

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

### **1.12 Temporary Communications Facilities**

- .1 Provide and pay for temporary telephone and fax hook up, line[s] necessary for own use.

### **1.13 Fire Protection**

- .1 Provide and maintain temporary fire protection equipment during performance of Work required by governing codes, regulations and bylaws including emergency vehicle access.

### **1.14 Scaffolding**

- .1 Construct and maintain scaffolding in rigid, secure and safe manner in accordance with occupational health & safety regulations.

- .2 Erect scaffolding independent of walls. Remove promptly when no longer required.

### **1.15 Hoisting**

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

### **1.16 Protection, Temporary Barriers and Enclosures**

- .1 Enclosure of Structure:
  - .1 Provide temporary weather tight secure protection for exterior openings until permanently enclosed. Design enclosures to withstand wind pressure. Secure construction areas with enclosures to secure materials and work.
  - .2 Provide temporary dust screens where dust generating work occurs.
- .2 Guardrails and Excavations:
  - .1 Provide secure, rigid guard rails and barricades around deep excavations, open edges of floors and roofs in accordance with WCB requirements.
- .3 Hoarding
  - .1 Erect Temporary Hoarding, as approved by Department Representative, for site enclosure security and control of pedestrian and vehicular traffic.
- .4 Access to Site:
  - .1 Maintain existing access roads and designated parking area in broom clean condition. Refer also to Section 01 14 00.
- .5 Protection of Building Finishes:
  - .1 Provide protection for completed and partially completed building finishes and equipment during performance of Work.
  - .2 Provide necessary screens, covers, and hoardings.
  - .3 Confirm with Owner's Representative locations and installation schedule three (3) days prior to installation.
  - .4 Be responsible for damage incurred due to lack of or improper protection.
- .6 Mold Control and Materials Protection
  - .1 Protect all building materials from mold growth and propagation during transit, storage and assembly in accordance with CCA82-2004 – Mold Guidelines for the Canadian Construction Industry.

### **1.17 Site Signs and Notices**

- .1 Only Project identification signboards and notices for safety or instructions are permitted on site.
- .2 Format, location and quantity of site signs and notices shall be approved by Owner's Representative.



- .3 Signs and notices for safety or instructions shall be in English language, or commonly understood graphic symbols.
- .4 Maintain signboards, signs and notices for duration of project. Remove and dispose of signs off site on completion of project.
- .5 No other signs will be permitted on site unless approved by the Owner's Representative.

#### **1.18 First Aid Facility**

- .1 Provide a clearly marked and fully stocked first-aid facility in a readily available location. Adhere to occupational health & safety regulations for first aid facilities.

#### **1.19 Equipment, Tools and Storage**

- .1 All construction personnel must remain accountable for their tools and equipment at all times. At no time should tools and equipment be left unattended when within reach of the travelling public.
- .2 Provide and maintain, in a clean and orderly condition, lockable weatherproof sheds for storage of tools, equipment and materials.
- .3 Locate materials not required to be stored in weatherproof sheds on site in a safe and secure manner to cause least interference with work activities and facility operations and security.

#### **1.20 Removal of Temporary Facilities**

- .1 Remove temporary facilities from site when directed by the Owner's Representative.

#### **1.21 Clean-up**

- .1 Remove construction debris, waste materials, packaging material from work site daily. (Refer to Section 01 74 00 and 01 74 21).
- .2 Clean dirt and mud tracked onto paved or surfaced roadways.
- .3 Store materials resulting from demolition activities that are salvageable. (Refer to Section 01 74 21)
- .4 At completion of Project: Remove and dispose of all debris, thoroughly clean and restore site to condition found at commencement of Work. Repair and make good to all damage caused by construction activities.

**END OF SECTION**



## PART 1 GENERAL

### 1.1 Related Sections

- .1 Section 01 45 00 Quality Control

### 1.2 Reference Standards

- .1 All design and construction work shall be executed in conformance with the latest editions of the following Codes, Laws, regulations and trade/manufacturing quality standards associations:
  - .1 National Building Code of Canada (NBCC).
  - .2 *(reserved)*
  - .3 Model National Energy Code of Canada for Buildings.
  - .4 CAN/CSA-B651 – Barrier-Free Design.
  - .5 National Fire Code, Latest Edition.
  - .6 NFPA – National Fire Protection Association.
  - .7 Canada Labour Code – Part 2.
  - .8 HRSDC Fire Protection – Fire Commissioner of Canada.
  - .9 Local Bylaws/Authorities having Jurisdiction.
  - .10 WorkSafe BC – Workers Compensation Board of BC.
  - .11 CSA – Canadian Standards Association.
  - .12 CGSB – Canadian General Standards Board.
  - .13 ULC – Underwriters Laboratories of Canada.
  - .14 ASTM – American Society for Testing Materials.
  - .15 ANSI – American National Standards Institute.
  - .16 AASHTO – American Association of State Highways & Transportation Officials.
  - .17 ASHRAE – American Society of Heating, Refrigeration and Air Conditioning Engineers.
  - .18 AWMAC – Architectural Woodwork Manufacturers Association of Canada.
  - .19 CSDFMA – Canadian Steel Door and Frame Manufacturer's Association.
  - .20 CRCA – Canadian Roofing Contractors Association.
  - .21 RCABC – Roofing Contractors Association of BC.
  - .22 AWCCBC – Association of Wall and Ceiling Contractors of BC.
  - .23 CISC – Canadian Institute of Steel Construction.
  - .24 CSSBI – Canadian Sheet Steel Building Institute.
  - .25 CUFCA – Canadian Urethane Foam Contractor's Association.
  - .26 MPI – the Master Painters Institute.
  - .27 NAAMM – National Association of Architectural Metal Manufacture<sup>ers</sup>

- .28 SMACNA – Sheetmetal and Air Conditioning Contractor's National Association, Inc.
- .29 NHLA – National Hardwood Lumber Association.
- .30 NLGA – National Lumber Grades Authority.
- .31 NFCA – National Floor Covering Association

### **1.3 Products/Material and Equipment**

- .1 Use NEW products/material and equipment unless otherwise specified. The term "products" is referred to throughout the specifications.
- .2 Use products of one 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 Owner's Representative in writing of any conflict between these specifications and manufacturer's instructions. Owner's Representative will designate which document is to be followed.
- .5 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.
- .6 Fastenings which cause spalling or cracking are not acceptable.
- .7 Use fastenings of standard commercial sizes and patterns with material and finish suitable for service.
- .8 Use heavy hexagon heads, semi-finished unless otherwise specified.
- .9 Bolts may not project more than 1 diameter beyond nuts.
- .10 Types of washers as follows:
  - .1 Plain type washers: use on equipment and sheet metal.
  - .2 Soft gasket lock type washers: use where vibrations occur.
  - .3 Resilient washers: use with stainless steel.
- .11 Deliver, store and maintain packaged material and equipment with manufacturer's seals and labels intact.
- .12 Prevent damage, moisture absorption, contact with organic matter, adulteration and soiling of products during delivery, handling and storage. Immediately remove rejected products from site.
- .13 Store products in accordance with suppliers' instructions.
- .14 Touch up damaged factory finished surfaces to Owner's Representative's satisfaction.
  - .1 Use primer or enamel to match original.
  - .2 Do not paint over nameplates.

### **1.4 Quality of Products**

- .1 Products, materials and equipment (referred to as products) incorporated into work shall be new, not damaged or defective, and of the best quality (compatible with the specifications) for the purpose intended. If requested, furnish evidence as to type, source

and quality of the products provided.

- .2 Defective products will be rejected regardless of previous inspections.
  - .1 Inspection does not relieve responsibility, but is precaution against oversight or error.
  - .2 Remove and replace defective products at own expense and be responsible for delays and expenses caused by rejection.
- .3 Retain purchase orders, invoices and other documents to prove that all products utilized in this Contract meet the requirements of the specifications. Produce documents when requested by the Owner's Representative.
- .4 Should any dispute arise as to quality or fitness of products, the decision rests strictly with the Owner's Representative based upon the requirements of the Contract documents.
- .5 Unless otherwise indicated in the specifications, maintain uniformity of manufacture for any particular or like item throughout the building.
- .6 Permanent labels, trademarks and nameplates on products are not acceptable in prominent locations, except where required for operating instructions, or when located in mechanical or electrical rooms.

#### **1.5 Availability of Products**

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

#### **1.6 Manufacturer's Instructions**

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

#### **1.7 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 Approved Product. Alternative products may be considered provided full technical data is received in writing by Owner's Representative in accordance with "Special Instructions to Tenderers".
- .5 When products are specified by a referenced standard or by or Performance specifications, upon request of Owner's Representative obtain from manufacturer an independent laboratory report showing that the product meets or exceeds the specified requirements.

**1.8 Substitution After Contract Award**

- .1 No substitutions are permitted without prior written approval of the Owner's Representative.
- .2 Proposals for substitution may only be submitted after Contract award. Such request must include statements of respective costs of items originally specified and the proposed substitution.
- .3 Proposals will be considered by the Owner's Representative if:
  - .1 products selected by tenderer from those specified are not available;
  - .2 delivery date of products selected from those specified would unduly delay completion of Contract, or
  - .3 alternative product to that specified, which is brought to the attention of and considered by Owner's Representative as equivalent to the product specified, and will result in a credit to the Contract amount.
- .4 Should the proposed substitution be accepted either in part or in whole, assume full responsibility and costs when substitution affects other work on the project. Pay for design or drawing changes required as result of substitution.
- .5 Amounts of all credits arising from approval of the substitutions will be determined by the Owner's Representative, and the Contract price will be reduced accordingly.

END OF SECTION



#### **1.4 FINAL CLEANING**

- .1 When Work is Substantially Performed, remove surplus products, tools, construction machinery and equipment not required for performance of remaining Work.
- .2 Remove waste products and debris other than that caused by others, and leave Work clean and suitable for occupancy.
- .3 Prior to final review, remove surplus products, tools, construction machinery and equipment.
- .4 Remove waste products and debris including that caused by other Contractors.
- .5 Remove waste materials from site at regularly scheduled times or dispose of as directed by Departmental Representative. Do not burn waste materials on site, unless approved by Departmental Representative.
- .6 Make arrangements with and obtain permits from authorities having jurisdiction for disposal of waste and debris.
- .7 Clean and polish glass, mirrors, hardware, wall tile, stainless steel, chrome, porcelain enamel, baked enamel, plastic laminate, and mechanical and electrical fixtures. Replace broken, scratched or disfigured glass.
- .8 Remove stains, spots, marks and dirt from decorative work, electrical and mechanical fixtures, furniture fitments, walls, and floors.
- .9 Clean lighting reflectors, lenses, and other lighting surfaces.
- .10 Vacuum clean and dust building interiors, behind grilles, louvres and screens.
- .11 Wax, seal, shampoo or prepare floor finishes, as recommended by manufacturer.
- .12 Inspect finishes, fitments and equipment and ensure specified workmanship and operation.
- .13 Broom clean and wash exterior walks, steps and surfaces; rake clean other surfaces of grounds. Sweep and wash clean paved areas.
- .14 Remove dirt and other disfiguration from exterior surfaces.
- .15 Clean and sweep roofs, gutters, areaways, and sunken wells.
- .16 Clean equipment and fixtures to a sanitary condition; clean or replace filters of mechanical equipment.
- .17 Clean roofs, downspouts, and drainage systems.
- .18 Remove debris and surplus materials from crawl areas and other accessible concealed spaces.
- .19 Remove snow and ice from access to building.

**END OF SECTION**



## **PART 1 GENERAL**

### **1.1 Related Sections**

- .1 Section 01 11 55 – General Instructions
- .2 Section 01 14 00 – Work Restrictions
- .3 Section 01 35 33 – Health & Safety Requirements
- .4 Section 01 51 00 –Temporary Facilities

### **1.2 Definitions**

- .1 Recyclable: Ability of product or material to be recovered at end of its life cycle and re-manufactured into new product for reuse by others.
- .2 Recycle: Process by which waste and recyclable materials are transformed or collected for purpose of being transferred into new products.
- .3 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.
- .4 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.
- .5 Salvage: Removal of structural and non-structural materials from deconstruction/disassembly projects for purpose of reuse or recycling.
- .6 Waste Reduction Workplan (WRW): a written report which addresses opportunities for reduction, re-use or recycling of materials.

### **1.3 Materials Source Separation Program (MSSP)**

- .1 Implement MSSP for waste generated on project in compliance with approved methods and as reviewed by Owner's Representative.
- .2 Provide on-site facilities for collection, handling, and storage of anticipated quantities of reusable and recyclable materials.
- .3 Provide containers to deposit reusable and recyclable materials.
- .4 Locate containers in locations, to facilitate deposit of materials without hindering daily operations.
- .5 Locate separated materials in areas which minimize material damage.
- .6 Collect, handle, store on-site, and transport off-site, salvaged materials in separate condition.
- .7 Transport to authorized recycling facility.

### **1.4 Storage, Handling and Protection**

- .1 Unless specified otherwise, materials for removal become Contractor's property.
- .2 Protect, stockpile, store and catalogue salvaged items.
- .3 Separate non-salvageable materials from salvaged items. Transport and deliver non-salvageable items to licensed disposal facility.
- .4 Protect structural components not removed for demolition from movement or damage.

- .5 Separate and store materials produced during dismantling of structures in designated areas.
- .6 Prevent contamination of materials to be salvaged and recycled and handle materials in accordance with requirements for acceptance by designated facilities.
  - .1 On-site source separation is recommended.
  - .2 Remove co-mingled materials to off-site processing facility for separation.
  - .3 Provide waybills for separated materials.
- .7 Do work in compliance with Waste Reduction Workplan.

### **1.5 Hazardous Materials Survey**

- .1 Comply with the recommendations and listed regulations of Appendix B - Hazardous Material Study (Total Safety.)

### **1.6 Disposal of Wastes**

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

### **1.7 Use of Site and Facilities**

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

## **PART 2 PRODUCTS**

**NOT USED**

## **PART 3 EXECUTION**

### **3.1 Application**

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

### **3.2 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

## **PART 1 GENERAL**

### **1.1 Submission**

- .1 Prepare instructions and data by personnel experienced in maintenance and operation of described products.
- .2 Revise content of documents as required before final submittal.
- .3 Phasing of submission:
  - .1 2 weeks before substantial performance of the work, submit to Owner's Representative 4 final copies of operation and maintenance manuals.
- .4 Ensure spare parts, maintenance materials and special tools provided are new, neither damaged nor defective, and of same quality and manufacture as products provided in work.
- .5 If requested, furnish evidence as to type, source and quality of products provided.
- .6 Defective products will be rejected, regardless of previous inspections. Replace products at own expense

### **1.2 Format**

- .1 All as-built drawings and operation and maintenance (O&M) manuals listed under the Scope of Work shall be converted, where necessary, into Portable Data File (PDF) format permit for viewing using the Acrobat Reader software free from the internet.

### **1.3 Contents, Each Volume**

- .1 Table of Contents – provide the following:
  - .1 Title of project.  
Date of submission.
  - .2 Names, addresses, and telephone numbers of Consultant and Contractor with name of responsible parties.
  - .3 Schedule of products and systems, indexed to content of volume.
- .2 For each product or system, 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 clearly 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 Building data shall be collected and stored in a database format as an integral part of the Program. Building data shall include the following:
  - .1 Building Name
  - .2 Building Address
  - .3 Facility Manager
  - .4 Building Photo

### **1.4 Operation and Maintenance Manual**

- .1 **Record drawings:**
  - .1 As work progresses, maintain accurate records to show all deviations from the

Contract Drawings. Note on as-built drawings as changes occur. At completion supply:

- .1 Two (2) set of CD's in AutoCad file format (version 2010) with all as-built information on the diskettes.
  - .2 Four (4) sets of printed as-built drawings.
  - .3 Submit one copy of check plots to Owner's Representative prior to final printing of as-built drawings.
  - .4 Retain original logo and title block area a small company logo, the text "AS-BUILT" and the date.
- .2 Final Drawings:
- .1 Drawings shall be converted from the original electronic files, such as CAD, into PDF format. If only the hard copies of the 'as-built' drawings are available, they shall be scanned and saved in PDF format. PDF files of the 'As-built' drawings shall be enhanced with the following bookmarks to zoom into legible views on the computer screen as a minimum:
    - .1 Drawing Number and Title
    - .2 Drawing Notes
    - .3 Major Equipment Locations
    - .4 Cross-links to other related drawings
    - .5 Revisions
  - .3 Cost for transferring as-built information from marked up working set of drawings to electronic format using ACAD and plotting services shall be included in the Contract.
- .2 **Maintenance Manual:**
- .1 Upon completion of project submit to Owner's Representative three (3) CD R/disk copies and one paper (in 3" D ring, loose leaf binder with spine and face pockets, to match Facility's existing) of Operations and Maintenance Manual, made up as follows:
    - .1 All as-built drawings and operation and maintenance (O&M) manuals listed under the Scope of Work shall be converted, where necessary, into Portable Data File (PDF) format for viewing using the Adobe Acrobat Reader.
    - .2 Organize files into CSI Masterformat numbering system or other approved descriptive titles. O&M data and as-built drawings shall be classified by their corresponding disciplines, including:
      - .1 Architectural
      - .2 Structural
      - .3 Mechanical
      - .4 Electrical
      - .5 Data & Communication
      - .6 Civil
    - .3 The manual shall, according to the type of services or disciplines, include the full contents of each hard copy of the O&M Manuals with the addition of Miscellaneous Maintenance Reports and Records, or as defined by the Owner's Representative. In general the following shall be included unless

specifically excluded by the Owner's Representative:

- .1 Introduction
- .2 Consultant/Contractor/Suppliers List
- .3 System Description
- .4 Maintenance and Lubrication Schedules
- .5 Testing and Commissioning (T&C) Reports
- .6 Misc. Reports
- .7 Specifications
- .8 Equipment and/or point schedules as identified in the hard copy documents.
- .9 Others as stipulated by the user

All Basic Documents PDF files shall be enhanced with appropriate bookmarks to facilitate searching of information within the document or linked to other relevant documents for references.

.4 Equipment data shall be classified into the following categories:

- .1 Equipment submittals
- .2 T&C Report
- .3 Maintenance Data
- .4 Maintenance Records
- .5 Photo

Provide a summary screen to list all equipment classified under a specific system. On the summary screen, provide direct links to the corresponding equipment data under each category with addition links to the relevant 'As-Built' drawings.

.5 Refer to Mechanical and Electrical Divisions for specific details for Mechanical and Electrical data.

.2 Changes made by addenda and change orders.

## **1.5 Equipment and Systems**

- .1 Operating procedures – include the following:
  - .1 Start-up, break-in, and routine normal operating instructions and sequences.
  - .2 Regulation, control, stopping, shutdown, and emergency instructions.
  - .3 Summer, winter, and any special operating instructions.
- .2 Maintenance requirements: list routine procedures for
  - .1 Each item of equipment and each system.
- .3 Provide servicing and lubrication schedule, and list of lubricants required.
- .4 Include manufacturer's printed operation and maintenance instructions.
- .5 Include sequence of operation by controls manufacturer.
- .6 Provide original manufacturer's parts list, illustrations, assembly drawings, and diagrams required for maintenance.
- .7 Provide installed control diagrams by controls manufacturer.
- .8 Provide Contractor's coordination drawings with installed colour coded piping diagrams.

- .9 Provide charts of valve tag numbers, with location and function of each valve, keyed to flow and control diagrams.
- .10 Provide list of original manufacturer's spare parts, current prices, and recommended quantities to be maintained in storage.
- .11 Additional requirements: as specified in individual specification Sections.

#### **1.6 Manufacturer's Documentation Reports**

- .1 When specified in individual Sections, require manufacturer to provide authorized representative to demonstrate operation of equipment and system, instruct Owner's Representative's indicated facility's personnel, and provide detailed written report that demonstration and instructions have been completed.
- .2 Owner's Representative will provide list of personnel to receive instructions, and will coordinate their attendance at agreed-upon times.

#### **1.7 Spare Parts**

- .1 Provide spare parts in quantities specified in individual specification Sections.
- .2 Provide items of same manufacture and quality as items in work.
- .3 Deliver to on-site location as directed; place and store.
- .4 Receive and catalogue all items. Submit inventory listing to the Owner's Representative. Include approved listings in maintenance manual.
- .5 Obtain receipt for delivered products and submit to Owner's Representative.

#### **1.8 Maintenance Materials**

- .1 Provide maintenance and extra materials in quantities specified in individual specification sections.
- .2 Provide items of same manufacture and quality as items in work.
- .3 Deliver to on-site location as directed; place and store.
- .4 Receive and catalogue all items. Submit inventory listing to the Owner's Representative. Include approved listings in maintenance manual.
- .5 Obtain receipt for delivered products and submit to Owner's Representative.

#### **1.9 Special Tools**

- .1 Provide special tools in quantities specified in individual specification Sections.
- .2 Provide items with tags identifying their associated function and equipment.
- .3 Deliver to location as directed; place and store.
- .4 Receive and catalogue all items.
  - .1 Submit inventory listing to the Owner's Representative.
  - .2 Include approved listings in maintenance manual.

#### **1.10 Warranties, Bonds, Test Reports, Inspection Reports**

- .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, Bonds, Test Results, Inspection Reports executed in duplicate by

subcontractors, suppliers, manufacturers, and inspection agencies within 10 days after completion of the applicable item of work.

- .4 Except for items put into use with the Owner's 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.

#### **1.11 Completion**

- .1 Submit a written certificate that the following have been performed:
  - .1 Work has been completed and inspected for compliance with the Contract documents.
  - .2 Defects have been corrected and deficiencies have been completed.
  - .3 Equipment and systems have been tested, adjusted and balanced, and are fully operational.
  - .4 Certificates required by the Boiler Inspection Branch, Fire Protection Engineering Services, PWGSC, Fire Marshall and local municipality, whichever is applicable.
  - .5 Operation of systems has been demonstrated to the personnel indicated by the Owner's Representative.
  - .6 Work is complete and ready for final inspection.

END OF SECTION





**Project No.: 4056 / 9W740  
Kitsilano Coast Guard Station-  
Building Envelope Rehabilitation  
Vancouver, BC**

APPENDIX A



**PART 1 GENERAL**

**1.1 Related Work**

- |    |                  |  |
|----|------------------|--|
| .1 | Section 01 14 00 | Work Restrictions  |
| .2 | Section 01 35 33 | Health and Safety Requirements                           |
| .3 | Section 01 35 43 | Environmental Procedures                                 |
| .4 | Section 01 51 00 | Temporary Facilities                                     |
| .5 | Section 01 74 21 | Waste Management and Disposal                            |
| .6 | Division 22 & 23 | Plumbing & HVAC  |
| .7 | Division 26      | Electrical   |
| .8 | Appendix 'B'     | Targeted, Hazardous Materials Sampling at 1661 Whyte Ave |
| .9 | Appendix 'C'     | Building Enclosure Condition Assessment Report 2015      |

**1.2 Submittals**

- .1 All submittals shall be in accordance with Section 01 33 00 – Submittal Procedures.

**1.3 Precautions**

- .1 Should material resembling spray or trowel applied asbestos or any other designated substance be encountered in the course of demolition, stop work, take preventative measures and notify the Consultant immediately. Do not proceed until written instructions have been received. Refer to Appendix 'B'.

**1.4 Protection**

- .1 Prevent movement, settlement or damage to adjacent structures and paving. Provide bracing and shoring as required. Make good damage and be liable for injury caused by demolition.
- .2 Take precautions during demolition to support parts of structures not being demolished, and if safety of existing booth appears to be endangered, cease operations and notify Consultant.
- .3 Prevent debris from blocking drainage which must remain in operation.
- .4 Take precaution during demolition to protect all adjacent finished surfaces. Make good any damage to adjacent surfaces.
- .5 Provide a temporary secure and weathertight enclosure for the duration of the Building Envelope work.
- .6 Fires burning and selling of waste of materials is not permitted on site.
- .7 Do not bury waste or materials on site.
- .8 Do not dispose of waste or volatile materials such as: mineral spirits, oil, petroleum based lubricants, or toxic cleaning solutions into storm or sanitary sewers. Ensure proper disposal procedures are maintained throughout project.

**1.5 Health and Safety**

- .1 Do construction occupational health and safety in accordance with Section 01 35 33 – Health and Safety Requirements and the Workers’ Compensation Board of BC latest regulations.

**1.6 Waste Management and Disposal**

- .1 Separate waste management materials for reuse and recycling in accordance with Section 01 74 21 – Waste Management and Disposal and the Waste Reduction Workplan, and the Waste Management Plan to the maximum extent economically possible.

**PART 2 LOCATIONS**

**2.1**

- .1 Demolition: existing exterior wall components & building appurtenances, as shown on drawings, to suit a renovated Building Envelope.
- .2 Refer to Plumbing, Mechanical and Electrical drawings and specifications for material required for removal, capping and/or diversion.
- .3 Items to be removed and turned over to Consultant are noted on the drawings.
- .4 Elements for removal and re-use are noted on the drawings.

**PART 3 EXECUTION**

**3.1 Work**

- .1 Dispose of demolished materials off site except where noted otherwise. Refer to Section 01 74 21.
- .2 Carefully remove all noted material in areas of renovation. Qualified tradesmen shall be used for the removal of all material scheduled for re-use. Contractor shall be responsible for making good, to the satisfaction of the Consultant, all damage to materials and equipment to be reinstalled.
- .3 Site-examine and record locations, conditions, etc., of all elements which must be removed then re-installed and made good after re-installation work.
- .4 Where existing piping, conduits, wall assemblies, wiring, applied items and other elements are removed, patch and make good affected surfaces which are to remain. Patching and remedial materials shall match adjacent existing unless otherwise noted.
- .5 Protect all existing elements and finishes not scheduled for replacement and store where directed as required. Make good where damaged.
- .6 Layout and execute all cutting and demolition such as to cause the least amount of disruption to remaining existing finishes, materials, elements and equipment.
- .7 Unless otherwise noted, all existing items noted as: “Remove and Dispose of” shall be considered as Contractor’s salvage.

END OF SECTION

**1.0 GENERAL**

**1.1 RELATED WORK**

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

**1.2 REFERENCES**

- .1 Canadian Standards Association (CSA International)
  - .1 CSA-A23.1-09/A23.2-09, Concrete Materials and Methods of Concrete Construction/Methods of Test and Standard Practices for Concrete.
  - .2 CSA-O86-09, Engineering Design in Wood.
  - .3 CSA O121-08, Douglas Fir Plywood.
  - .4 CSA O151-09, Canadian Softwood Plywood.
  - .5 CSA O153-13, Poplar Plywood.
  - .6 CAN/CSA-O325-07, Construction Sheathing.
  - .7 CSA O437 Series-93 (R2006), Standards for OSB and Waferboard.
  - .8 CSA S269.1- Falsework for Construction Purposes.
  - .9 CAN/CSA-S269.3-M92 (R2003), Concrete Formwork, National Standard of Canada
- .2 Underwriters' Laboratories of Canada (ULC)
  - .1 CAN/ULC-S701-05, Standard for Thermal Insulation, Polystyrene, Boards and Pipe Covering.

**1.3 SUBMITTALS**

- .1 Submittals in accordance with Section 01 33 00 –Submittal Procedures.
- .2 Submit WHMIS MSDS - Material Safety Data Sheets in accordance with Section 01 35 33 – Health and Safety Requirements.
- .3 Co-ordinate submittal requirements and provide submittals required by Section 01 33 00.
- .4 Indicate method and schedule of construction, shoring, stripping and re-shoring procedures, materials, arrangement of joints, special architectural exposed finishes, ties, liners, and locations of temporary embedded parts. Comply with CSA S269.1, for falsework drawings and Comply with CAN/CSA-S269.3 for formwork drawings.
- .5 Indicate formwork design data: permissible rate of concrete placement, and temperature of concrete, in forms.
- .6 Indicate sequence of erection and removal of formwork/falsework as directed by Departmental Representative.
- .7 The contractor is responsible for the design of all formwork and shoring and for complying with all Workers' Compensation Board regulations pertaining to formwork construction,

design and inspection. Formwork and shoring shall be designed by a qualified professional engineer registered or licensed in British Columbia.

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

- .1 Store and manage hazardous materials in accordance with Section 01 51 00 – Temporary Facilities.
- .2 Waste Management and Disposal:
  - .1 Separate and recycle waste materials in accordance with Section 01 74 19 – Waste Management and Disposal.

### **2.0 PRODUCTS**

#### **2.1 MATERIALS**

- .1 Materials and resources in accordance with Section 01 61 00 – Product Requirements.
- .2 Formwork materials:
  - .1 For concrete without special architectural features, use wood and wood product formwork materials to CSA-O121, CAN/CSA-O86, CSA O437 Series, CSA-O153.
  - .2 Rigid insulation board: to CAN/ULC-S701.
- .3 Form ties:
  - .1 For concrete not designated 'Architectural', use removable or snap-off metal ties, fixed or adjustable length, free of devices leaving holes larger than 25 mm diameter in concrete surface.
- .4 Form liner:
  - .1 Plywood: high density overlay, medium density overlay, Douglas Fir to CSA O121, Canadian Softwood Plywood to CSA O151 or Poplar to CSA O153 grade, square edge, 20 mm thick.
- .5 Form release agent: non-toxic, biodegradable, low VOC.
- .6 Form stripping agent: colourless mineral oil, non-toxic, biodegradable, low VOC, free of kerosene, with viscosity between 70 and 110s Saybolt Universal 15 to 24 mm<sup>2</sup>/s at 40 degrees C, flashpoint minimum 150 degrees C, open cup.
- .7 Falsework materials: to CSA-S269.1.
- .8 Sealant: to Section 07 92 00 – Joint Sealants.

### **3.0 EXECUTION**

#### **3.1 FABRICATION AND ERECTION**

- .1 Verify lines, levels and centres before proceeding with formwork/falsework and ensure dimensions agree with drawings.
- .2 Obtain Departmental Representative's approval for use of earth forms framing openings not indicated on drawings.
- .3 Hand trim sides and bottoms and remove loose earth from earth forms before placing concrete.
- .4 Fabricate and erect falsework in accordance with CSA S269.1.
- .5 Do not place shores and mud sills on frozen ground.
- .6 Provide site drainage to prevent washout of soil supporting mud sills and shores.
- .7 Fabricate and erect formwork in accordance with CAN/CSA-S269.3 to produce finished concrete conforming to shape, dimensions, locations and levels indicated within tolerances required by CSA-A23.1/A23.2.
- .8 Align form joints and make watertight.
  - .1 Keep form joints to minimum.
- .9 Use 25 mm chamfer strips on external corners and/or 25 mm fillets at interior corners, joints, unless specified otherwise.
- .10 Form chases, slots, openings, drips, recesses, expansion and control joints as indicated.
- .11 Build in anchors, sleeves, and other inserts required to accommodate Work specified in other sections.
  - .1 Ensure that anchors and inserts will not protrude beyond surfaces designated to receive applied finishes, including painting.
- .12 Line forms for following surfaces:
  - .1 Exposed faces of abutments, wingwalls, piers and pylons: do not stagger joints of form lining material and align joints to obtain uniform pattern. Secure lining taut to formwork to prevent folds.
  - .2 Pull down lining over edges of formwork panels.
  - .3 Ensure lining is new and not reused material.
  - .4 Ensure lining is dry and free of oil when concrete is poured.
  - .5 Application of form release agents on formwork surface is prohibited where drainage lining is used.
  - .6 If concrete surfaces require cleaning after form removal, use only pressurized water stream so as not to alter concrete's smooth finish.
  - .7 Cost of textile lining is included in price of concrete for corresponding portion of Work.

- .13 Clean formwork in accordance with CSA-A23.1/A23.2, before placing concrete.

### **3.2 REMOVAL AND SHORING**

- .1 Leave formwork in place for following minimum periods of time after placing concrete.
  - .1 Three days for walls and sides of beams.
  - .2 Three days for columns.
  - .3 Twenty eight days for beam soffits, slabs, decks and other structural members, or one days when replaced immediately with adequate shoring to standard specified for falsework.
  - .4 One days for footings and abutments.
- .2 Remove formwork when concrete has reached 75% of its design strength or minimum period noted above, whichever comes later, and replace immediately with adequate reshoring.
- .4 Provide necessary reshoring of members where early removal of forms may be required or where members may be subjected to additional loads during construction as required.
- .5 Space reshoring in each principal direction at not more than 3000 mm apart.
- .5 Re-use formwork and falsework subject to requirements of CSA-A23.1/A23.2.

**END OF SECTION**



## **1.0 GENERAL**

### **1.1 RELATED WORK**

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

### **1.2 REFERENCES**

- .1 American Concrete Institute (ACI)
  - .1 SP-66-04, ACI Detailing Manual 2004.
    - .1 ACI 315-99, Details and Detailing of Concrete Reinforcement.
    - .2 ACI 315R-04, Manual of Engineering and Placing Drawings for Reinforced Concrete Structures.
  - .2 American Society for Testing and Materials International (ASTM)
    - .1 ASTM A143/A143M-03, Standard Practice for Safeguarding Against Embrittlement of Hot-Dip Galvanized Structural Steel Products and Procedure for Detecting Embrittlement.
    - .2 ASTM A185/A185M-07, Standard Specification for Steel Welded Wire Reinforcement, Plain, for Concrete.
    - .3 ASTM A497/A497M-07, Standard Specification for Steel Welded Wire Reinforcement, Deformed, for Concrete.
  - .3 Canadian Standards Association (CSA International)
    - .1 CSA-A23.1-09/A23.2-09, Concrete Materials and Methods of Concrete Construction/Methods of Test and Standard Practices for Concrete.
    - .2 CSA-A23.3-04, Design of Concrete Structures.
    - .3 CAN/CSA-G30.18-M92(R2002), Billet-Steel Bars for Concrete Reinforcement, A National Standard of Canada.
    - .4 CSA-G40.20/G40.21-04, General Requirements for Rolled or Welded Structural Quality Steel/Structural Quality Steel.
    - .5 CAN/CSA-G164-M92(R2003), Hot Dip Galvanizing of Irregularly Shaped Articles, A National Standard of Canada.
    - .6 CSA W186-M1990(R2012), Welding of Reinforcing Bars in Reinforced Concrete Construction.
  - .4 Reinforcing Steel Institute of Canada (RSIC)
    - .1 RSIC-2004, Reinforcing Steel Manual of Standard Practice.

### **1.3 SUBMITTALS**

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

- .2 Prepare reinforcement drawings in accordance with RSIC Manual of Standard Practice and ACI 315.
- .3 Submit shop drawings including placing of reinforcement and indicate:
  - .1 Bar bending details.
  - .2 Lists.
  - .3 Quantities of reinforcement.
  - .4 Sizes, spacings, locations of reinforcement and mechanical splices if approved by Departmental Representative, with identifying code marks to permit correct placement without reference to structural drawings.
  - .5 Indicate sizes, spacings and locations of chairs, spacers and hangers.
- .4 Detail lap lengths and bar development lengths to CSA-A23.3, unless otherwise indicated.
  - .1 Provide type A tension lap splices where indicated unless otherwise indicated.
- .5 When Chromate solution is used as replacement for galvanizing non-prestressed reinforcement, provide product description for review by Departmental Representative prior to its use.
- .6 Quality Assurance: Provide the following to the Departmental Representative.
  - .1 Mill Test Report: upon request, provide Departmental Representative with certified copy of mill test report of reinforcing steel, minimum 4 weeks prior to beginning reinforcing work.
  - .2 Upon request submit in writing to Departmental Representative proposed source of reinforcement material to be supplied.

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

- .1 Store and manage hazardous materials in accordance with Section 01 51 00 – Temporary Facilities.
- .2 Waste Management and Disposal:
  - .1 Separate and recycle waste materials in accordance with Section 01 74 19 – Waste Management and Disposal.

#### **2.0 PRODUCTS**

##### **2.1 MATERIALS**

- .1 Materials and resources in accordance with Section 01 61 00- Product Requirements.

- .2 Substitute different size bars only if permitted in writing by Departmental Representative.
- .3 Reinforcing steel: billet steel, grade 400, deformed bars to CAN/CSA-G30.18, unless indicated otherwise.
- .4 Reinforcing steel: weldable low alloy steel deformed bars to CAN/CSA-G30.18.
- .5 Cold-drawn annealed steel wire ties: to ASTM A497/A497M.
- .6 Deformed steel wire for concrete reinforcement: to ASTM A497/A497M.
- .7 Welded steel wire fabric: to ASTM A185/A185M.
  - .1 Provide in flat sheets only.
- .8 Welded deformed steel wire fabric: to ASTM A497/A497M.
  - .1 Provide in flat sheets only.
- .9 Chairs, bolsters, bar supports, spacers: to CSA-A23.1/A23.2.
- .10 Mechanical splices: subject to approval of Departmental Representative.
- .11 Plain round bars: to CSA-G40.20/G40.21.

## **2.2 FABRICATION**

- .1 Fabricate reinforcing steel in accordance with CSA-A23.1/A23.2, ACI 315 and Reinforcing Steel Manual of Standard Practice by the Reinforcing Steel Institute of Canada.
  - .1 ACI 315R unless indicated otherwise.
- .2 Obtain Departmental Representative's approval for locations of reinforcement splices other than those shown on placing drawings.
- .3 Upon approval of Departmental Representative, weld reinforcement in accordance with CSA W186.
- .4 Ship bundles of bar reinforcement, clearly identified in accordance with bar bending details and lists.

## **2.3 SOURCE 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 beginning reinforcing work.

- .2 Upon request inform Departmental Representative of proposed source of material to be supplied.

### **3.0 EXECUTION**

#### **3.1 PREPARATION**

- .1 Conduct bending tests to verify bar fragility in accordance with ASTM A143/A143M.

#### **3.2 FIELD BENDING**

- .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 slow and steady pressure.
- .3 Replace bars, which develop cracks or splits.

#### **3.3 PLACING REINFORCEMENT**

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

**END OF SECTION**

## **1.0 GENERAL**

### **1.1 RELATED WORK**

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

### **1.2 REFERENCES**

- .1 American Society for Testing and Materials International (ASTM)
  - .1 ASTM C109-12, Test Method for Compressive Strength of Hydraulic Cement Mortars (Using 2 in. or 50-mm Cube Specimens). ASTM D260-86 (2001), Standard Specification for Boiled Linseed Oil.
  - .2 ASTM C309-11, Specification for Liquid Membrane-Forming Compounds for Curing Concrete.
  - .3 ASTM C332-09, Specification for Lightweight Aggregates for Insulating Concrete.
  - .4 ASTM C827-10, Test Method for Early Volume Change of Cementitious Mixtures.
  - .5 ASTM D1751-04(R2008), Standard Specification for Preformed Expansion Joint Filler for Concrete Paving and Structural Construction (Non-extruding and Resilient Bituminous Types).
  - .6 ASTM D1752-04a(2008), Specification for Preformed Sponge Rubber and Cork Expansion Joint Fillers for Concrete Paving and Structural Construction.
  - .7 ASTM C 260 – 10a, Specifications for Air-Entraining Admixtures for Concrete.
  - .8 ASTM C 494M – 13, Specifications for Chemical Admixtures for Concrete.
- .2 Canadian General Standards Board (CGSB)
  - .1 CAN/CGSB-19.24-M90, Multicomponent, Chemical-Curing Sealing Compound.
- .3 Canadian Standards Association (CSA International)
  - .1 CSA-A23.1-09 Concrete Materials and Methods of Concrete Construction.
  - .2 CSA-A23.2-09, Methods of Test for Concrete.
  - .3 CAN/CSA-A3000-08, Cementitious Materials Compendium.
  - .4 CSA-A3001-03, Cementitious Materials for Use in Concrete.
  - .5 CAN/CSA-G30.18-M92(R2002), Billet-Steel Bars for Concrete Reinforcement.

### **1.3 CERTIFICATES**

- .1 Provide certification that mix proportions selected will produce concrete of quality, yield and strength as specified in concrete mixes, and will comply with CAN/CSA-A23.1.
- .2 Provide certification that plant, equipment, and materials to be used in concrete comply with requirements of CAN/CSA-A23.1.

### **1.4 QUALITY ASSURANCE**

- .1 Minimum 2 weeks prior to starting concrete work, submit proposed quality control procedures for Departmental Representative's approval for following items:
  - .1 Falsework erection.
  - .2 Hot weather concrete.
  - .3 Cold weather concrete.
  - .4 Curing.
  - .5 Finishes.
  - .6 Formwork removal.
  - .7 Joints.
- .2 Health and Safety Requirements: do construction occupational health and safety in accordance with Section 01 35 33 - Health and Safety Requirements.

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

- .1 Concrete hauling time: maximum allowable time limit for concrete to be delivered to site of Work and discharged not to exceed 120 minutes after batching.
  - .1 Modifications to maximum time limit must be agreed to by the Departmental Representative and concrete producer as described in CSA A23.1/A23.2.
  - .2 Deviations to be submitted for review by the Departmental Representative.
- .2 Concrete delivery: ensure continuous concrete delivery from plant meets CSA A23.1/A23.2.

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

- .1 Separate and recycle waste materials in accordance with Section 01 74 19 – Waste Management and Disposal.

## **2.0 PRODUCTS**

### **2.1 MATERIALS**

- .1 Portland cement: to CAN/CSA-A3000.

- .2 Supplementary cementing materials: with minimum 10% Type F fly ash replacement, by mass of total cementitious materials to CAN/CSA A3000.
- .3 Water: to CAN/CSA-A23.1.
- .4 Aggregates: to CAN/CSA-A23.1. Coarse aggregates to normal density.
- .5 Air entraining admixture: to CAN/CSA-A3000.
- .6 Chemical admixtures: to CAN/CSA-A3000. Departmental Representative to approve accelerating or set retarding admixtures during code and hot weather placing.
- .7 Shrinkage compensating grout: premixed compound consisting of non-metallic aggregate, Portland cement, water reducing and plasticizing agents.
  - .1 Compressive strength: 50 MPa at 28 days.
  - .2 Consistency:
    - .1 Fluid: to ASTM C827. Time of efflux through flow cone (ASTM C939), under 30 s.
    - .2 Flowable: to ASTM C827. Flow table, 5 drops in 3 s, (ASTM C109, applicable portion) 125 to 145%.
    - .3 Plastic: to ASTM C827. Flow table, 5 drops in 3 s, (ASTM C109, applicable portions) 100 to 125%.
    - .4 Dry pack to manufacturer's requirements.
- .7 Non premixed dry pack grout: composition of non metallic aggregate Portland cement with sufficient water for the mixture to retain its shape when made into a ball by hand and capable of developing compressive strength of 50 MPa at 28 days.
- .8 Curing compound: to CAN/CSA-A23.1 white and to ASTM C309, Type 1-chlorinated rubber.
- .9 Cushion pads: tough, resilient, weather, moisture, and oil resistant material that will not corrode or cause corrosion, consisting of either layers of approved cotton duck saturated and bound together by approved rubber or synthetic compounds, or made from specially compounded synthetic materials.
- .10 Ribbed waterstops: extruded PVC [Arctic Grade] of sizes indicated with welded corner and intersecting pieces:
  - .1 Tensile strength: to ASTM D412, method A, Die "C", minimum 11.4 MPa.
  - .2 Elongation: to ASTM D412, method A, Die "C", minimum 275%.
  - .3 Tear resistance: to ASTM D624, method A, Die "B", minimum 48 kN/m.
- .11 Premoulded joint filler:
  - .1 Bituminous impregnated fibreboard: to ASTM D1751.

- .2 Sponge rubber: to ASTM D1752, Type I, flexible grade.
- .12 Weep hole tubes: plastic.
- .13 Dovetail anchor slots: minimum 0.6 mm thick galvanized steel with insulation filled slots.
- .14 Dampproof membrane:
  - .1 Kraft/polyethylene membrane:
    - .1 Plain: .05 mm thick polyethylene film bonded to 2.44 kg/m<sup>2</sup> asphalt treated creped kraft.
    - .2 Reinforced: two .05 mm thick polyethylene films bonded each side of 2.44 kg/m<sup>2</sup> asphalt treated creped kraft paper, reinforced with 13 x 13 mm fibreglass scrim.
    - .3 Membrane adhesive: as recommended by membrane manufacturer.
- .15 Dampproofing: Emulsified asphalt, mineral colloid type, unfilled: to CAN/CGSB-37.2, and to Section 07 13 52 – Modified Bituminous Sheet Waterproofing.
- .16 Polyethylene film: 0.25mm (6 mil) thickness to CAN/CGSB-51.34.

**2.2 MIXES**

- .1 Proportion normal density concrete in accordance with CAN/CSA-A23.1, Alternative 1 to give the following properties:
  - .1 Cement: Type GU Portland cement.
  - .2 Minimum compressive strength at 28 days, class of exposure and nominal size of coarse aggregate:
 

Member	minimum 28-days strength (MPa) Category	maximum aggregate size (mm)	exposure class	air
				content
Concrete Curb (Exterior)	25	10	C-2	1
Slab on Grade (Exterior)	32	20	C-2	1
  - .3 Slump at time and point of discharge: To CSA-A23.1 Clause 4.3.2.3. When super plasticizers are used, the slump may be increased by shall kept below the point where segregation will occur. The cost of super plasticizers shall be included in the cost of the concrete. Smaller aggregate size may be used where necessary to increase slump.



- .4 Air content: To CSA-A23.1 Table 2 & 4 to suit appropriate exposure class.
- .5 Chemical admixtures: following admixtures in accordance with to ASTM C494M. Admixtures shall contain no salts or acids.
- .6 Concrete mix designs shall be submitted to a material consultant for approval and to Departmental representative for review prior to any concrete work.

### **3.0 EXECUTION**

#### **3.1 PREPARATION**

- .1 Obtain Departmental Representative's approval before placing concrete. Provide 48 hours notice prior to placing of concrete.
- .2 Pumping of concrete is permitted only after approval of equipment and mix.
- .3 Ensure reinforcement and inserts are not disturbed during concrete placement.
- .4 Prior to placing of concrete obtain Departmental Representative's approval of proposed method for protection of concrete during placing and curing.
- .5 Maintain accurate records of poured concrete items to indicate date, location of pour, quality, air temperature and test samples taken.
- .6 In locations where new concrete is dowelled to existing work, drill holes in existing concrete. Place steel dowels of deformed steel reinforcing bars and pack solidly with epoxy grout to anchor and hold dowels in positions as indicated.
- .7 Do not place load upon new concrete until authorized by Departmental Representative.

#### **3.2 CONSTRUCTION**

- .1 Perform cast-in-place concrete work in accordance with CSA-A23.1.
- .2 Sleeves and inserts.
  - .1 No sleeves, ducts, pipes or other openings shall pass through joists, beams, column capitals or columns, except where indicated or approved by Departmental Representative.
  - .2 Where approved by Departmental Representative, set sleeves, ties, pipe hangers and other inserts and openings as indicated or specified elsewhere. Sleeves and openings greater than 100 x 100 mm not indicated, must be approved by Departmental Representative.

- .3 Do not eliminate or displace reinforcement to accommodate hardware. If inserts cannot be located as specified, obtain approval of modifications from Departmental Representative before placing of concrete.
  - .4 Check locations and sizes of sleeves and openings shown on drawings.
  - .5 Set special inserts for strength testing as indicated and as required by non-destructive method of testing concrete.
- .3 Anchor bolts.
- .1 Set anchor bolts to templates under supervision of appropriate trade prior to placing concrete.
  - .2 With approval of Departmental Representative, grout anchor bolts in holes drilled after concrete has set. Drilled holes to be to manufacturer's recommendations.
  - .3 Protect anchor bolt holes from water accumulations, snow and ice build-ups.
  - .4 Set bolts and fill holes with epoxy grout.
  - .5 Locate anchor bolts used in connection with expansion shoes, rollers and rockers with due regard to ambient temperature at time of erection.
- .4 Drainage holes and weep holes:
- .1 Form weep holes and drainage holes in accordance with Section 03 10 00 - Concrete Forms and Accessories. If wood forms are used, remove them after concrete has set.
  - .2 Install weep hole tubes and drains as indicated.
- .5 Dovetail anchor slots:
- .1 Install continuous vertical anchor slot to forms where masonry abuts concrete wall or columns.
  - .2 Install continuous vertical anchor slots at [800] mm oc where concrete walls are masonry faced.
- .6 Grout under base plates using procedures in accordance with manufacturer's recommendations which result in 100% contact over grouted area.
- .7 Finishing:
- .1 Finish concrete in accordance with CAN/CSA-A23.1.
  - .2 Use procedures acceptable to Departmental Representative or those noted in CAN/CSA-A23.1 to remove excess bleed water. Ensure surface is not damaged.
- .8 Waterstops:
- .1 Install waterstops to provide continuous water seal. Do not distort or pierce waterstop in such a way as to hamper performance. Do not displace

- reinforcement when installing waterstops. Use equipment to manufacturer's requirements to field splice waterstops. Tie waterstops rigidly in place.
- .2 Use only straight, heat sealed butt joints in field. Use factory welded corners and intersections unless otherwise approved by Departmental Representative.
- .9 Joint fillers:
- .1 Furnish filler for each joint in single piece for depth and width required for joint, unless otherwise authorized by Departmental Representative. When more than one piece is required for a joint, fasten abutting ends and hold securely to shape by stapling or other positive fastening.
  - .2 Locate and form isolation, construction and expansion joints as indicated. Install joint filler.
  - .3 Use 12 mm thick joint filler to separate slabs-on-grade from vertical surfaces and extend joint filler from bottom of slab to within 12 mm of finished slab surface unless indicated otherwise.
- .10 Dampproof membrane:
- .1 Install dampproof membrane under concrete slabs-on-grade inside building.
  - .2 Lap dampproof membrane minimum 150 mm at joints and seal.
  - .3 Seal punctures in dampproof membrane before placing concrete. Use patching material at least 150 mm larger than puncture and seal.
- .11 Locations of construction joints shall be submitted to the departmental representative for review in advance and prior to commencement of construction.
- .12 Supply and set anchor bolts, sleeves, pipe hangers, expansion joints and other inserts and openings as indicated in the structural drawings and specifications or in documents by other consultants.
- .13 All dowels, anchor bolts, embedded plates and other inserts shall be placed before the concrete is poured.
- .14 Slab on grade joints shall be 35mm deep sawcuts spaced maximum 4500mm apart, layout of joints shall be approved by the Departmental representative, seal with flexible joint sealer to prevent ingress of water.

### **3.3 SITE TOLERANCE**

- .1 All horizontal surfaces shall meet the Class A Slab and Floor Finish classification (+/- 8mm) in accordance with Table 22 of CAN/CSA-A23.1 straight edge method.
- .2 Tolerance closer than those specified in CSA-A23.1 may be required at certain locations for structural, architectural and construction requirements.

### **3.4 FIELD QUALITY CONTROL**

- .1 Inspection and testing of concrete and concrete materials will be carried out by a CSA certified Testing Laboratory designated by Departmental Representative in accordance with CAN/CSA-A23.1. Submit all concrete testing results to the departmental representative.
- .2 Contractor will pay for costs of tests as specified in Section 01 11 55 – General Instructions.
- .3 Departmental Representative will take additional test cylinders during cold weather concreting. Cure cylinders on job site under same conditions as concrete which they represent.
- .4 Non-destructive Methods for Testing Concrete shall be in accordance with CAN/CSA-A23.2.
- .5 Inspection or testing by Departmental Representative will not augment or replace Contractor quality control nor relieve him of his contractual responsibility

### **3.5 VERIFICATION**

- .1 Quality Control Plan: ensure concrete supplier meets performance criteria of concrete as established in PART 2 - PRODUCTS, by Departmental Representative and provide verification of compliance.

### **3.6 CLEANING**

- .1 Use trigger operated spray nozzles for water hoses.
- .2 Designate cleaning area for tools to limit water use and runoff.
- .3 Cleaning of concrete equipment to be done in accordance with Section 01 35 43: Environmental Procedures.

**END OF SECTION**

## **1.0 GENERAL**

### **1.1 RELATED SECTIONS**

- .1 Section 05 31 00 – Steel Decking.
- .2 Section 05 50 00 – Metal Fabrication.

### **1.2 REFERENCES**

- .1 American Society for Testing and Materials International, (ASTM)
  - .1 ASTM A 36/A 36M-12, Specification for Carbon Structural Steel.
  - .2 ASTM A 307-12, Specification for Carbon Steel Bolts and Studs, 60,000psi Tensile.
  - .3 ASTM A 325-10e1, Specification for Structural Bolts, Steel, Heat Treated, 120/105 ksi Minimum Tensile Strength.
  - .4 ASTM A 325M-13, Standard Specification for Structural Bolts, Steel, Heat Treated, 830 MPa Minimum Tensile Strength Metric.
- .2 Canadian Institute of Steel Construction (CISC)/Canadian Paint Manufacturer's Association (CPMA).
  - .1 CISC/CPMA 1-73a, Quick-Drying, One-Coat Paint for Use on Structural Steel.
  - .2 CISC/CPMA 2-75, Quick-Drying, Primer for Use on Structural Steel.
- .3 Canadian Standards Association (CSA International)
  - .1 CAN/CSA-G40.20-04 (R2009), General Requirements for Rolled or Welded Structural Quality Steel.
  - .2 CAN/CSA-G40.21-04 (R2009), Structural Quality Steels.
  - .3 CAN/CSA-G164-M92 (R2003), Hot Dip Galvanizing of Irregularly Shaped Articles.
  - .4 CAN/CSA-S16-09, Design of Steel Structures.
  - .5 CSA W47.1-09, Certification of Companies for Fusion Welding of Steel Structures.
  - .6 CSA W48-06 (R2011), Electrodes.
  - .7 CSA W55.3-08, Resistance Welding Qualification Code for Fabricators of Structural Members Used in Buildings.
  - .8 CSA W59-03 R(2008), Welded Steel Construction (Metal Arc Welding)

## **1.2 DESIGN OF DETAILS AND CONNECTIONS**

- .1 Design details and connections in accordance with requirements of CAN/CSA-S16-09 to resist forces, moments, shears and allow for movements indicated.
- .2 If connection for shear only (standard connection) is required:
  - .1 Select framed beam shear connections from an industry accepted publication such as "Handbook of the Canadian Institute of Steel Construction".
- .3 If shears are not indicated, select or design connections to support reaction from 120% maximum uniformly distributed load that can be safely supported by beam in bending (60% each end), provided no point loads act on beam.
- .4 At the Departmental Representative's request, submit sketches and design calculations for non-standard connections, stamped and signed by qualified professional engineer licensed in the Province of British Columbia, Canada.

## **1.4 SHOP DRAWINGS**

- .1 Submit shop drawings including fabrication and erection documents and materials list in accordance with Section 01 33 00 – Submittal Procedures.
- .2 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.
- .3 All shop drawings to be signed, sealed by professional engineer licensed in British Columbia, Canada.
- .4 The Professional Engineer responsible for the shop drawings shall inspect the installation of the work for conformance with the design and the shop drawings, and shall upon completion of the work submit to the Consultant a completed Schedule S-B: Assurance of Professional Design and Commitment for Field Review by Supporting Registered Professional, and Schedule S-C: Assurance of Professional Field Review and Compliance by Supporting Registered Professional.

## **1.5 QUALITY ASSURANCE**

- .1 Submit 2 copies of mill test reports showing chemical and physical properties and other details of steel to be incorporated into work at least 2 weeks prior to fabrication of structural steel. Mill test reports shall be certified by metallurgists qualified to practice in British Columbia, Canada.

- .2 Fabricator of structural steel shall, in addition, provide an affidavit stating that materials and products used in fabrication conform to applicable material and products standards called for by design drawings and specifications.

## **1.6 WASTE MANAGEMENT AND DISPOSAL**

- .1 Separate and recycle waste materials in accordance with Section 01 74 19 –Waste Management and Disposal.

## **2.0 PRODUCTS**

### **2.1 MATERIALS**

- .1 Structural steel: to CAN/CSA-G40.21 Grade as indicated on drawings.
- .2 Anchor bolts: ASTM A307 unless noted otherwise on drawings.
- .3 Bolts, nuts and washers: to ASTM A325.
- .4 Welding materials: to CSA W48 Series and CSA W59 and certified by Canadian Welding Bureau.
- .5 Shop paint primer: to CISC/CPMA 1.
- .6 Hot dip galvanizing: galvanize steel, where indicated, to CAN/CSA-G164, minimum zinc coating of 600 g/m<sup>2</sup>.
- .7 Galvanize touch-up primer: to CISC/CPMA 1.
- .8 Shear studs: to CSA W59, Appendix H.

### **2.2 FABRICATION**

- .1 Fabricate structural steel in accordance with CAN/CSA-S16 and in accordance with reviewed shop drawings.
- .2 Install shear studs in accordance with CSA W59.
- .3 Continuously seal members that required by remediation with continuous field welds where appropriate. Grind smooth.

### **2.3 SHOP PAINTING**

- .1 Clean, prepare surfaces and field prime structural steel in accordance with CAN/CSA-S16 except where members to be encased in concrete.
- .2 Clean members, remove loose mill scale, rust, oil, dirt and other foreign matter. Prepare surface according to SSPC SP7 brush off blast.

- .3 Apply one coat of CISC/CMPD2-75 primer in shop to steel surfaces to achieve minimum dry film thickness of 3 to 4 mils, except:
  - .1 Surfaces to be encased in concrete.
  - .2 Surfaces to receive field installed stud shear connections.
  - .3 Surfaces and edges to be field welded.
  - .4 Faying surfaces of friction-type connections.
  - .5 Below grade surfaces in contact with soil.
- .4 Apply paint under cover, on dry surfaces when surface and air temperatures are above 5 degrees C.
- .5 Maintain dry condition and 5 degrees C minimum temperature until paint is thoroughly dry.
- .6 Strip paint from bolts, nuts, sharp edges and corners before prime coat is dry.

### **3.0 EXECUTION**

#### **3.1 GENERAL**

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

#### **3.2 CONNECTION TO EXISTING WORK**

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

#### **3.3 MARKING**

- .1 Mark materials in accordance with CAN/CSA G40.20/G40.21. 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 CAN/CSA-S16 and in accordance with reviewed erection drawings.
- .2 Field cutting or altering structural members: to 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 The Departmental Representative will not be responsible for inspection of the Contractor's work as described in Clause 7.12 of the CISC Code of Standard Practice for Structural Steel. The Contractor is responsible for the accuracy and completeness of his own work and shall verify that the structural steel has been fabricated, erected and finished in accordance with the contract specifications.
- .2 Inspection and testing of materials and workmanship will be carried out by testing laboratory designated by Departmental Representative.
- .3 Testing requirements are as follows:
  - .1 Visual Field Inspection and Bolt Torque Testing (Random 10% of Bolts) of all bolted connections.
  - .2 Non-Destructive Testing of Welds:
    - 100% of all welds to be visually inspected
  - .3 Verify the certification and conformance of the steel fabricator and erector to any relevant CSA Standards.
- .4 Provide safe access and working areas for testing on site, as required by testing agency and as authorized by Departmental Representative.
- .5 Submit test reports to Departmental Representative within 1 week of completion of inspection.
- .6 Costs of tests will be borne by Contractor as specified in Section 01 11 00 – General Instructions.

### **3.6 FIELD PAINTING**

- .1 Paint in accordance with Section 09 91 13 – Exterior Painting and Section 09 91 23 – Interior Painting.
- .1 Touch up all damaged surfaces and surfaces without shop coat with primer to MPI Product #76 except as specified otherwise. Apply in accordance with MPI system INT5.1A.

**END OF SECTION**

## **1.0 GENERAL**

### **1.1 RELATED WORK**

- .1 Structural Steel for Buildings Section 05 12 23
- .2 Metal Fabrications Section 05 50 00

### **1.2 REFERENCE STANDARDS**

- .1 Canadian Standards Association (CSA)
  - .1 CAN/CSA-S136-07, North American Specification for the design of Cold Formed Steel Structural Members.
- .2 Canadian Sheet Steel Building Institute (CSSBI)
  - .1 CSSBI 10M-08, Standard for Steel Roof Deck.
- .3 American Society for Testing and Materials International, (ASTM)
  - .1 ASTM A 653/A653M-11, Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.
  - .2 ASTM A792/A 792M-05, Specification for Steel Sheet, 55% Aluminum-Zinc Alloy-Coated by the Hot-Dip Process.

### **1.3 DESIGN REQUIREMENTS**

- .1 Design steel deck using limit states design in accordance with CSA S136 and, CSSBI 10M and CSSBI 12M.
- .2 Steel deck and connections to steel framing to carry dead, live and other loads including lateral loads, diaphragm action and uplift as indicated.
- .3 Deflection under specified live load not to exceed 1/240 of span, except that when gypsum board ceilings are hung directly from deck, live load deflection not to exceed 1/360 of span.

### **1.4 SUBMITTALS**

- .1 Submit shop drawings in accordance with Section 01 33 00 – Submittal Procedures.
  - .1 Indicate deck plan, profile, dimensions, base steel thickness, metallic coating designation, connections to supports and spacings, projections, openings, reinforcement details and accessories.
  - .2 Submit drawings stamped and signed by qualified professional

engineer registered or licensed in Provinces of British Columbia,  
Canada.

- .3 Submit design calculations if requested by Departmental Representative.

## **1.5 WASTE MANAGEMENT AND DISPOSAL**

- .1 Separate and recycle waste materials in accordance with  
Section 01 74 19 – Waste Management and Disposal.

## **2.0 PRODUCTS**

### **2.1 MATERIALS**

- .1 Zinc-iron Alloy (ZF) coated steel sheet: to ASTM A653/A653M structural quality Grade 230, with ZF75 coating, for interior surfaces not exposed to weather, unpainted finish, 0.96mm minimum base steel thickness and as indicated on drawing 5606.
- .2 Decks to be painted: zinc-iron alloy coated decks suitable for finish painting.
- .3 Zinc (Z) coated steel sheet: to ASTM A653/A653M structural quality Grade 230, with Z275, coating, regular spangle surface, not chemically treated for paint finish, for exterior surfaces exposed to weather, 0.96mm minimum base steel thickness.
- .4 Aluminum-zinc alloy (AZ) coated steel sheet: to ASTM 792/A 792M structural quality grade 230, with AZ 150 coating, surface not chemically treated for paint finish, for exterior surfaces exposed to weather, 0.96mm minimum base steel thickness.
- .5 Closures: as indicated.
- .6 Cover plates, deck flute closures and flashings: steel sheet with minimum base steel thickness of 0.96 mm. Metallic coating same as deck material.
- .7 Primer: zinc rich, ready mix to MPI #200.
- .8 Caulking: to Section 07 92 00 Joint Sealants.
- .9 Fire stopping: to Section 07 84 00 Fire stopping.

### **2.2 TYPES OF DECKING**

- .1 Floor deck: 0.96mm minimum base steel thickness or as indicated on drawing, 38mm deep profile, non-cellular interlocking side laps.

### **3.0 EXECUTION**

#### **3.1 GENERAL**

- .1 Structural steel work: in accordance with CAN/CSA-S136 and CSSBI 10M.
- .2 Weld studs of 20mm diameter x 75mm long spaced at maximum 300 on center to structural member or approved alternative and as shown on plans.

#### **3.2 ERECTION**

- .1 Erect steel deck as indicated and in accordance with CSSBI 10M and in accordance with reviewed erection drawings.
- .2 Where possible, supply and install decking in length that will permit continuity over a minimum of three spans.
- .3 Butt ends: to 1.5 to 3 mm gap. Install steel cover plates over gaps wider than 3 mm.
- .4 Lap ends: to 50 mm minimum.
- .5 Provide minimum welded studs of 20mm diameter at 300 o/c for steel member as indicated on structural drawings.
- .6 Deck edge and chord members. All edges of steel decking shall be supported by edge angles fastened to main structural members, unless noted otherwise, use L150x100x5 at roofs.
- .7 Unless noted otherwise, all members designated as diaphragm chord members and all perimeter edge angles shall be connected by full strength groove welds or by full strength splice plates on each leg to form continuous compression and tension members. Weld edge angles and chords to Beams, joists and shear connectors and weld deck to angles chords and structural members as shown on drawings or as detailed by decking contractor.

### **3.3 OPENINGS AND AREAS OF CONCENTRATED LOADS**

- .1 No reinforcement required for openings cut in deck which are smaller than 150 mm square.
- .2 For larger openings, detail framing as follows:

Location	Opening Size (In any direction)	Reinforcing
Roof/Floor	<150mm but < 500mm	L51x51x6.4 running perpendicular to Flutes and welded to minimum two flutes each side of opening
Roof/Floor	>500mm but < 1000mm	L76x76x6.4 all around and extending to Structural members
Roof/Floor	>1000mm	See special details.

### **3.4 CONNECTIONS**

- .1 Install connections in accordance with CSSB1-10M.

**END OF SECTION**

## **1.0 GENERAL**

### **1.1 RELATED REQUIREMENTS**

- .1 CIP Concrete Section 03 30 00
- .2 Painting & Coating Section 09 90 00

### **1.2 REFERENCES**

- 1 ASTM International
  - .1 ASTM A 53/A 53M-07, Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated Welded and Seamless.
  - .2 ASTM A 269 08, Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated Welded and Seamless.
  - .3 ASTM A 307-07v, Standard Specification for Carbon Steel Bolts and Studs, 60,000 PSI Tensile Strength.
  - .4 ASTM B 209, Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate.
  - .5 ASTM B 221, Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Shapes and Tubes.
- .2 CSA International
  - .1 CSA G40.20/G40.21-04 (R2009), General Requirements for Rolled or Welded Structural Quality Steel/Structural Quality Steel.
  - .2 CAN/CSA G164-M92 (R2003), Hot Dip Galvanizing of Irregularly Shaped Articles.
  - .3 CSA S16-09, Design of Steel Structures.
  - .4 CSA W48-06, Filler Metals and Allied Materials for Metal Arc Welding (Developed in co-operation with the Canadian Welding Bureau).
  - .5 CSA W59-M03(R2008), Welded Steel Construction (Metal Arc Welding) [Metric].
    - .1 GS-11-2008, 2nd Edition], Paints and Coatings.
- .3 Health Canada / Workplace Hazardous Materials Information System (WHMIS)
  - .1 Material Safety Data Sheets (MSDS).
- .4 The Master Painters Institute (MPI)
  - .1 Architectural Painting Specification Manual - current edition.
- .5 Green Seal Environmental Standard GS 03 (anti-corrosive primer).

### **1.3 SUBMITTALS**

- .1 Submit in accordance with Section 01 33 00 – Submittal Procedures.
- .2 Product Data:
  - .1 Submit manufacturer's instructions, printed product literature and data sheets for sections, plates, pipe, tubing, bolts and include product characteristics, performance criteria, physical size, finish and limitations.
  - .2 Submit two copies of WHMIS MSDS in accordance with Section 01 35 33 - Health and Safety Requirements
    - .1 For finishes, coatings, primers, and paints applied on site: indicate VOC concentration in g/L.
- .3 Shop Drawings:
  - .1 Submit drawings stamped and signed by professional engineer registered or licensed in Province of British Columbia, Canada. Submit BCBC 2012 Schedule B and C-B and Federal letter of Assurance Schedule B1, B2 and C-B as per Appendix L.
  - .2 Indicate materials, core thicknesses, finishes, connections, joints, method of anchorage, number of anchors, supports, reinforcement, details, and accessories.

### **1.3 QUALITY ASSURANCE**

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

### **1.4 DELIVERY, STORAGE & HANDLING**

- .1 Deliver, store and handle materials in accordance with Section 01 61 00 - Common Product Requirements and with manufacturer's written instructions.
- .2 Delivery and Acceptance Requirements: deliver materials to site in original factory packaging, labeled with manufacturer's name and address.
- .3 Storage and Handling Requirements:
  - .1 Store materials off ground in dry location and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.
  - .2 Replace defective or damaged materials with new.
- .4 Develop Construction Waste Management Plan related to Work of this Section and in



accordance with Section 01 74 19 Waste Management and Disposal.

- .5 Packaging Waste Management: remove for reuse of pallets, crates, padding, and packaging materials as specified in Construction Waste Management Plan in accordance with Section 01 74 19 Waste Management and Disposal.

## **2.0 PRODUCTS**

### **2.1 MATERIALS**

- .1 Steel sections and plates: to CSA G40.20/G40.21, Grade 350W.
- .2 Exterior Steel, stair stringers and pipe rails: to ASTM A 53/A 53M standard weight galvanized finish.
- .3 Welding materials: to CSA W59.
- .4 Welding electrodes: to CSA W48 Series.
- .5 Bolts and anchor bolts: to ASTM A 307.
- .6 Grout: non-shrink, non-metallic, flowable, 15 MPa at 24 hours.
- .7 Aluminum: to ASTM B209, clear anodized finish.
- .8 Unistrut: unistrut P1100 or similar profile embedded in concrete, 1.9mm (14ga) hot-dipped galvanized finish conforming to ASTM A123.
- .9 Grout: non-shrink, non-metallic flowable, 15MPC at 24 hours.
- .10 Stainless Steel Sheet: Conforming to ASTM A167, Type 304, #4 Satin Finish. 12 Gauge for use in seismic joint cover plate.
- .11 Security fasteners: screws and bolts with spanner type heads to prevent removal except with special tools; non-corrosive type.
- .12 Shop coat primer: to CAN/CGSB-1.40M.
- .13 Galvanize touch-up primer: zinc rich, read mix to CGSB-1-GP-181M.
- .14 Stair treads- Galvanized welded steel stair tread with checkered plate noising maximum spacing between bearing bars to be 13mm, cross bar spacing to be about 100mm, serrated.
- .15 Stair Landing Bar Grating- Galvanized welded steel bar grating for stair landing, maximum

spacing between bearing bars to be 13mm, cross bar spacing to be about 100mm, serrated.

- .16 Aluminum Trench Covers at PHS – ASTM 209 Aluminum 3003-H22 tread plate 6mm minimum thickness, checker pattern; Frames – 6061-T6 aluminum flat bar, 19mm minimum thickness, run flat bars in both direction. Edge of cover to be reinforced with 40x40x6mm thick Aluminum angle.

## **2.2 FABRICATION**

- .1 Fabricate work square, true, straight and accurate to required size, with joints closely fitted and properly secured.
- .2 Use self-tapping shake-proof flat headed screws on items requiring assembly by screws or as indicated.
- .3 Where possible, fit and shop assemble work, ready for erection.
- .4 Ensure exposed welds are continuous for length of each joint. File or grind exposed welds smooth and flush.

## **2.3 FINISHES**

- .1 Galvanizing: hot dipped galvanizing with zinc coating 610 g/m<sup>2</sup> to CAN/CSA-G164.
- .2 Shop coat primer: CGSB 1GP 40M in accordance with chemical component limits and restrictions requirements and VOC limits of GC-03. Prepare surface to an abrasive blast specification SSPC-SP10.
- .3 Zinc primer: To CGSB 1GP 48, CISC/CPMA 1-73A, CISC/CPMA 2-75 in accordance with chemical component limits and restrictions requirements and VOC limits of GC-03. Prepare surface to an abrasive blast SSPC-SP10.

## **2.4 ISOLATION COATING**

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

## **2.5 SHOP PAINTING**

- .1 Primer: VOC limit 250 g/L maximum to GC-03.
- .2 Apply one shop coat of primer to metal items, with exception of aluminum, galvanized or concrete encased items.
- .3 Use primer unadulterated, as prepared by manufacturer. Paint on dry surfaces, free from rust, scale, grease. Do not paint when temperature is lower than 7 degrees C.
- .4 Clean surfaces to be field welded; do not paint.

## **2.6 RAILINGS AND GUARDRAILS**

- .1 Steel fabrications: formed to shapes and sizes as indicated.
- .2 Galvanize exterior pipe railings after fabrication. Shop coat prime all interior steel work after fabrication.

## **3.0 EXECUTION**

### **3.1 EXAMINATION**

- .1 Verification of Conditions: verify conditions of substrates previously installed under other Sections or Contracts are acceptable for metal fabrications installation in accordance with manufacturer's written instructions.
  - .1 Visually inspect substrate in presence of Departmental Representative.
  - .2 Inform Departmental Representative of unacceptable conditions immediately upon discovery.
  - .3 Proceed with installation only after unacceptable conditions have been remedied and after receipt of written approval to proceed from Departmental Representative.
  - .4 Contractor shall verify field measurements are as shown on shop drawings prior to fabrication.

### **3.2 ERECTION**

- .1 Do welding work in accordance with CSA W59 unless specified otherwise.
- .2 Erect metalwork square, plumb, straight, and true, accurately fitted, with tight joints and intersections.
- .3 Provide suitable means of anchorage acceptable to Departmental Representative such as dowels, anchor clips, bar anchors, expansion bolts and shields, and toggles.
- .4 Exposed fastening devices to match finish and be compatible with material through which they pass.
- .5 Supply components for work by other trades in accordance with shop drawings and

schedule.

- .6 Weld field connection.
- .7 Deliver items over for casting into concrete and building into masonry together with setting templates to appropriate location and construction personnel.
- .8 Touch-up rivets, field welds, bolts and burnt or scratched surfaces with primer after completion of:
  - .1 Primer: maximum VOC limit 250 g/L to GC-03.
- .9 Touch-up galvanized surfaces with zinc rich primer where burned by field welding.
  - .1 Primer: maximum VOC limit 250 g/L to GC-03.

### **3.3 RAILINGS & GUARDRAILS**

- .1 Install steel railings and guardrails and locations as indicated.

### **3.4 CLEANING**

- .1 Progress Cleaning: clean in accordance with Section 01 74 11 - Cleaning.
  - .1 Leave Work area clean at end of each day.
- .2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 74 11 - Cleaning.
- .3 Waste Management: separate waste materials for recycling in accordance with Section 01 74 19 - Waste Management and Disposal.

### **3.5 PROTECTION**

- .1 Protect installed products and components from damage during construction.
- .2 Repair damage to adjacent materials caused by metal fabrications installation.

**END OF SECTION**

## **PART 1 GENERAL**

### **1.1 Reference Standards**

- .1 Pressure treat wood in accordance with CAN/CSA-080-08.

### **1.2 Waste Management and Disposal**

- .1 Separate and recycle waste materials in accordance with Section 01 74 21 – Waste Management and Disposal.
- .2 Remove from site and dispose of packaging materials at appropriate recycling facilities.
- .3 Collect and separate for disposal paper, plastic, polystyrene and corrugated cardboard packaging material for recycling in accordance with Waste Management Plan.
- .4 Divert unused wood materials from landfill to recycling facility approved by Consultant.
- .5 Do not dispose of preservative treated wood through incineration, or into water courses.
- .6 Do not dispose of preservative treated wood with materials destined for recycling or reuse.

### **1.3 Submittals**

- .1 All submittals shall be in accordance with Section 01 33 00 – Submittal Procedures.

## **PART 2 PRODUCTS**

### **2.1 Preservative Treatment**

- .1 New lumber & plywood exposed to weather, standing water, copings, window linings, roof curbs, wood in contact with concrete: factory treated with clear, Ammoniacal Copper Quat (ACQ-B) or Copper Azole (CA) preservative to CAN/CSA-080.2 to obtain an average net retention of 4.0kg/m<sup>3</sup> by assay. All new plywood exposed to weather must be treated to CAN/CSA-080.9.
- .2 Material shall bear Canadian Wood Preservers Bureau (CWPB) stamps.
- .3 Roof & deck sheathing: CCA 4.0kg/m<sup>3</sup>, or Borate (as B203) 2.8 kg/m<sup>3</sup>.
- .4 Strapping for wall cavities outside the moisture barrier: CCA 4.0kg/m<sup>3</sup>, or Borate (as B203) 2.8 kg/m<sup>3</sup>.
- .5 Liners for windows & doors, and parapet copings: Borate (as B203) 2.8 kg/m<sup>3</sup>.

### **2.2 Fire Retardant Treatment**

- .1 Treat scheduled wood and plywood material by pressure impregnation with fire resistive chemicals in accordance with CAN/CSA-080-M or ASTM D-2898 to provide a flame spread ration of less than 25.
- .2 Fire retardant treated wood to bear underwriter's label or be accompanied by a certificate in a form acceptable to the Consultant showing compliance.
- .3 Conform strictly to the manufacturer's directions for delivery, handling and storage of treated wood.
- .4 Use galvanized steel fasteners for fastening fire retardant treated wood products.
- .5 An example of an accepted product is "Dricon FRT". Other products having the same proven characteristics will not be excluded

## **PART 3 EXECUTION**

### **3.1 Preparation**

- .1 Treat surfaces of material with wood preservative, before installation.
- .2 Re-treat surfaces exposed by cutting, trimming or boring with liberal brush application of preservative before installation.

### **3.2 Preparation**

- .1 Comply with A.W.P.A.M. 4-77.
- .2 Remove with fine sandpaper, chemical deposits on treated wood to receive applied finish.
- .3 Treat cuts with hand-applied preservative.

### **3.3 Treatment**

- .1 Field treatment of all 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 submersion.
- .2 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.
- .3 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.
  - .2 Minimum 3 minute immersion of wood in preservative.

END OF SECTION

**PART 1 GENERAL**

**1.1 Related Work**

- |    |                  |                                      |
|----|------------------|--------------------------------------|
| .1 | Section 05 41 00 | Structural Metal Stud Framing        |
| .2 | Section 06 05 00 | Wood Treatment                       |
| .3 | Section 06 20 00 | Finish Carpentry                     |
| .4 | Section 07 27 13 | Self-Adhesive Membrane               |
| .5 | Section 07 52 00 | Modified Bituminous Membrane Roofing |
| .6 | Section 09 29 00 | Gypsum Board                         |

**1.2 References**

- .1 CSA B111-1974 (R1998) Wire Nails, Spikes and Staples.
- .2 CAN/CSA-G164-M92 (R1998) Hot Dip Galvanizing of Irregularly Shaped Articles.
- .3 CAN/CSA-080-08, Wood Preservation.
- .4 CAN3-O86-01 Engineering Design in Wood (Limit States Design).
- .5 CSA O112 Series-M1977 (R1999) CSA Standards for Wood Adhesives.
- .6 CSA O121-M1978 Douglas Fir Plywood.
- .7 CAN/CSA-O141-91 (R1999) Softwood Lumber.
- .8 CSA O151-M1978 (R1998) Canadian Softwood Plywood.
- .9 CAN/CSA-O325.0-92 (R1998) Construction Sheathing.
- .10 CAN3-O437.0/O437.1-93 Waferboard and Strandboard/Test Method for Waferboard and Strandboard.
- .11 CAN/CGSB-71.26-M88 Adhesive for Field-Gluing Plywood to Lumber Framing and Metal Studs.
- .12 National Lumber Grades Authority (NLGA) Standard Grading Rules for Canadian Lumber 1996.
- .13 National Building Code of Canada, (NBCC), 2010.
- .14 Galvanizing to CAN/CSA-G164.

**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.

**1.4 Submittals**

- .1 All submittals shall be in accordance with Section 01 33 00 – Submittal Procedures.

**PART 2 PRODUCTS**

**2.1 Lumber Material**

- .1 Lumber: Unless specified otherwise, softwood, S4S, moisture content 15% or less in accordance with following standards:
  - .1 CAN/CSA-O-141.
  - .2 NLGA Standard Grading Rules for Canadian Lumber.
- .2 Glued end-jointed (finger-jointed) lumber is not acceptable.

- .3 Framing and board lumber: in accordance with 2015 NBCC and Structural Drawings.
- .4 Furring, blocking, strapping, nailing strips, grounds, rough bucks, cants, curbs, fascia backing and sleepers:
  - .1 Use S4S material suitable for wood treatment.
  - .2 Board Sizes: all species, suitable for wood treatment, NLGA Standard or better grade.
  - .3 Dimension Sizes: all species suitable for wood treatment, NLGA Standard or better grade.
  - .4 **All lumber which will be covered with membrane shall be weather-protected during delivery, storage and after installation until covered with said membrane.**

## 2.2 Panel Materials

- .1 Plywood for nailers associated with roofing, walls & interior and exterior blocking, shall be of type, grade and thickness as specified in accordance with the following standards:
  - .1 Douglas Fir plywood (DFP): to CSA-0121.
  - .2 Canadian softwood plywood (CSP): to CSA 0151.
  - .3 Construction sheathing: to CAN/CSA-O325.0.
  - .4 **All plywood to be covered with any type of membrane shall be delivered to site with a maximum 15% moisture content, stored under cover and weather-protected after installation until covered with membrane.**
- .2 Except as specified otherwise, panels shall be nom. 1219 x 2438 mm size, square edge or tongue and groove as scheduled and noted.
- .3 Exterior plywood nailers associated with roofing and fenestration shall be pressure treated DFP or CSP sheathing grade.
- .4 Where indicated, plywood shall be factory-pressure-treated and fire-retardant treated in accordance with Section 06 05 00.

## 2.3 Fastenings and Accessories

- .1 In accordance with Part 9, of 2015 NBCC as supplemented by following requirements except where specific type is indicated.
- .2 Nails, spikes and staples to 2015 NBCC and CSA B111 except:
  - .1 Use hot-dipped galvanized finish steel for exterior work and interior highly humid areas.
  - .2 Use purpose made special coated fastenings for preservative and fire-retardant treated lumber.
- .3 Bolt, nut, washer, screw and pin type fasteners: with hot-dipped galvanized finish to CSA G164, for exterior work, interior highly humid areas and purpose-coated for pressure preservative and fire-retardant treated lumber, elsewhere with primer paint finish where installed on sight-exposed surfaces. Bolts: 13 mm diam. unless otherwise indicated, complete with nuts and washers.
- .4 Use surface fastenings of following types, except where specific type is indicated:
  - .1 To hollow masonry, plaster and panel surfaces use toggle bolt.
  - .2 To solid masonry and concrete use expansion shield with lag screw, jute fibre or lead plug with wood screw.
  - .3 To structural steel use bolts through drilled hole, or welded stud-bolts or power driven self-drilling screws, or welded stud-bolts.
- .5 General purpose adhesive: to CSA O112 series.



- .6 Proprietary fasteners: toggle bolts, expansion shields and lag bolts, screws and lead or inorganic fibre plugs, explosive actuated fastening devices, recommended for purpose by manufacturer.
- .7 Exposed fasteners located exterior of the waterproofing membrane: A300 stainless steel.
- .8 Concealed fasteners located exterior of the waterproofing membrane to be 2000-hour salt-spray tested (DT2000 or similar).
- .9 All fasteners in contact with ACQ treated wood to be stainless steel.

#### **2.4 Wood Preservative**

- .1 Ref. Wood Treatment - Section 06 05 00.
- .2 All new plywood sheathing and dimension lumber to be treated at an approved facility.
- .3 Pressure treated is preferred to site applied wood treatment. Site application should be limited to cut surfaces.
- .4 Preservative field treatment of borate treated lumber or plywood is to be inorganic borate based insecticide / fungicide.

#### **2.5 Dampproof Membrane**

- .1 Polyethylene Film: to CAN/CGSB-51.34, Type 1, 6 mil thickness as per Section 07 10 00.

#### **2.6 Exterior Wall Sheathing**

- .1 Refer to Section 09 29 00.

#### **2.7 Sheathing Membrane**

- .1 Refer to Section 07 27 13.

### **PART 3 EXECUTION**

#### **3.1 Preparation**

- .1 Treat noted and scheduled surfaces of material with wood preservative, before installation.
- .2 Apply preservative by dipping, or by brush to completely saturate and maintain wet film on surface for minimum 3 minute soak on lumber and one minute soak on plywood.
- .3 Re-treat surfaces exposed by cutting, trimming or boring with liberal brush application of preservative before installation.
- .4 Treat all following materials:
  - .1 Wood associated with roofing and fenestration, curbs, nailers, sleepers on roof deck.

#### **3.2 Installation General**

- .1 Comply with requirements of 2015 NBCC Part 9 supplemented by notes on structural drawings and the following paragraphs:
- .2 Install members true to line, levels and elevations, square and plumb.
- .3 Construct continuous members from pieces of longest practical length.
- .4 Install spanning members with "crown-edge" up.
- .5 Select exposed framing and trim for appearance. Install lumber and panel materials so that grade-marks and other defacing marks are concealed or are removed by sanding where materials are left exposed.
- .6 Frame, anchor, fasten, tie and brace members to provide necessary stren

- .7 Countersink bolts where necessary to provide clearance for other work.

### **3.3 Furring and Blocking**

- .1 Install furring and blocking as required to space-out and support surface applied cabinets, wall panelling, door stops, grab bars, plumbing fixtures and washroom accessories as indicated.
- .2 Locate, align and plumb faces of furring and blocking to accurate location of items supported.

### **3.4 Rough Bucks Nailers**

- .1 Install wood bucks and nailers as indicated:
  - .1 Wood bucks and linings around frames for doors, windows and access panels.
- .2 Except where indicated otherwise, use material at least 38 mm thick secured with 10 mm diameter bolts located within 12 mm from ends of members and uniformly spaced at 1200 mm between.
- .3 Countersink bolts where necessary to provide clearance for other work.

### **3.5 Roof Fascias, Nailers, Curbs & Plates**

- .1 Install fascia backing, nailers, curbs and other wood supports for roofing and sheet metal work, and roof mounted equipment, access hatches as indicated.
- .2 Secure with galvanized 10 mm diameter bolts where indicated, galvanized s/m screws elsewhere. Locate fastenings within 12 mm from ends and uniformly spaced between. Space bolts at 1200 mm and screws at 600 mm centres except where indicated otherwise.
- .3 Nailers in contact with concrete or masonry shall have 2 ply roofing felt or equivalent between contact surfaces and shall be fixed in place with anchor bolts as scheduled.
- .4 Plywood cap build ups are typically two layers of plywood which must be secured to the parapet though all layers of the plywood. Purpose made screws are to secure both layers of plywood to the substrate.

### **3.6 Electrical Equipment Backboard**

- .1 Provide backboards for mounting electrical and telephone equipment as indicated. Use 19 mm thick DFP/GLS on 19 x 38 mm furring around perimeter and at maximum 300 mm intermediate spacing.

### **3.7 Miscellaneous Framing Erection**

- .1 Frame, anchor, fasten, tie and brace members to provide necessary strength and rigidity.
- .2 This Section shall make allowance for and provide (as required for strength and against movement and deflection), blocking, bracing, backing, in-fill pieces, fasteners, furring, grounds, shims, bucks, dowels, bolts and washers, and other hardware, whether indicated or not, as directed by the Consultant and as required by the National Building Code of Canada.

### **3.8 Waste Management and Disposal**

- .1 Separate and recycle waste materials in accordance with the Waste Reduction Work Plan, and the Waste Management Plan to the maximum extent economically possible. Refer to Section 01 74 21.
- .2 Separate wood waste in accordance with the Waste Management Plan and place in designated areas in the following categories for recycling; solid wood/soft wood/hard wood. Treated, painted or contaminate wood.

- .3 Separate wood waste in accordance with the Waste Management Plan and place in designated areas in the following categories for reuse on site: sheet materials, framing members, multiple off-cuts of any size.
- .4 Set aside damaged wood and dimensional lumber off-cuts for approved alternative uses (e.g. braving, blocking, cripples, bridging). Store this separate re-useable wood waste convenient to cutting station and area work.
- .5 Separate metal, plastic, wood and corrugated cardboard packaging in accordance with the Waste Management Plan and place in designated areas for recycling.
- .6 Do not burn at the project site.
- .7 Fold up metal banding, flatten, and place in designated area for recycling.

END OF SECTION



**PART 1 GENERAL**

**1.1 Related Work**

- |    |                  |                              |
|----|------------------|------------------------------|
| .1 | Section 05 50 00 | Metal Fabrications           |
| .2 | Section 06 10 00 | Rough Carpentry              |
| .3 | Section 08 44 00 | Aluminum Curtainwall         |
| .4 | Section 08 80 00 | Glazing                      |
| .5 | Section 09 22 00 | Non-Structural Metal Framing |
| .6 | Section 09 90 00 | Painting and Coating         |

**1.2 Reference Standards**

- .1 Do millwork to "custom" grade to Millwork Standards of the Architectural Woodwork Manufacturer's Association of Canada, latest edition.

**1.3 Submittals**

- .1 All submittals shall be in accordance with Section 01 33 00- Submittal Procedures.
- .2 Shop Drawings
- .1 Clearly indicate details of construction, profiles, jointing, fastening and other related details.
  - .2 Submit shop drawings to all interfacing sections requiring coordination.
- .3 Samples
- .1 Submit duplicate 600mm long samples of each type of trim and moulding.

**1.4 Coordination & Verification**

- .1 Verify all dimensions & existing conditions on job site prior to all shop fabrication and work on site. Where major discrepancies occur, alert Consultant immediately.
- .2 Coordinate work of this section with that of wall, ceiling-framing, electrical and mechanical sections where millwork and trim interface with drywall partitions, ceiling suspension, plumbing, electrical outlets, etc.
- .3 It shall be the responsibility of this section to verify the dimensions and installation details for all Owner supplied equipment and furnishings requiring cut-outs, adaptations and interfacing with millwork items.

**1.5 Inspection**

- .1 Architectural woodwork shall be manufactured and installed to AWMAC Quality Standards ("Custom" Grade) and shall be subject to an inspection at the plant and/or site, by an appointed inspector approved by the M.M.A.B.C. (the BC Chapter of AWMAC). Such inspection costs shall be included in the tender price for this project. Shop drawings shall be submitted for review before any work is commenced. Where it is deemed necessary by the Consultant, a sample cabinet (consisting of a minimum of 1 drawer, 1 door, showing precisely the materials, hardware and the type of construction the manufacturer intends to use), shall be submitted for inspection.
- .2 Any work which does not meet AWMAC Quality Standards as specified, shall be replaced by this Trade Contractor at no additional cost to the owner and to the satisfaction of the Consultant and the inspector.

## **1.6 Waste Management and Disposal**

- .1 Separate waste materials for reuse and recycling in accordance with Section 01 74 21 Waste Management and Disposal and the Waste Reduction Workplan, and the Waste Management Plan to the maximum extent economically possible.

## **PART 2 PRODUCTS**

### **2.1 Materials**

- .1 Softwood lumber: to C.S.A. 0141-1970 and National Lumber Grades Authority requirements, with maximum moisture content of 6% for interior applications as follows:
  - .1 Lumber selected for paint finish: Fir species to AWMAC Custom Grade.
- .2 Decorative veneer: Edge-grain fir plywood.
- .3 Douglas Fir plywood: to C.S.A. 0121-M1978, good one side, sanded grade.
- .4 Shelving plywood: premium birch ply, sanded two sides, appearance grade for painting.
- .5 Nails and staples: to C.S.A. B111-1974, galvanized for interior highly humid areas and plain finish elsewhere.
- .6 Fiberboard: Standard of Acceptance: 'Ranger Premium MDF Board', 'Medité'. Medium Density (MDF) to ANSI/A208.2 and tested in accordance with ASTM D1037. All MDF shall be free of urea-formaldehyde.

## **PART 3 EXECUTION**

### **3.1 Interior Trim**

- .1 Standing and running trim for transparent and painted finish shall be A.W.M.A.C. Custom Grade construction.
- .2 Trim shall be as detailed.

### **3.2 Installation**

- .1 Set and secure cabinetwork and finish carpentry items in place rigid, plumb and square.
- .2 Use purpose designed fixture attachments for wall mounted components.
- .3 Use threaded steel concealed joint fasteners to align and secure adjoining cabinet units, counter tops, and shelving.
- .4 When necessary to cut and fit on site, make material with ample allowance for cutting. Provide trim for scribing and site cutting.
- .5 Permanently fix cabinet and counter bases to floor using appropriate angles and anchorages.
- .6 Counter-sink all semi-concealed anchorage devices used to wall mount components and conceal with solid plugs of species to match surrounding wood. Place flush with surrounding surfaces.
- .7 Carefully scribe cabinetwork which is against other building materials, leaving gaps of 0.8mm maximum. Do not use additional overlay trim for this purpose.
- .8 Install and adjust all cabinet hardware to ensure smooth and correct operation.
- .9 Site-install all computer wire grommets into millwork as directed by owner and indicated on drawings.
- .10 Use proper exterior and interior panel adhesives for shop-bonding aluminum sheets to backing. Use proper pressing techniques to eliminate potential "Telegraphing" and "oil

- canning”.
- .11 Coordinate tile and stone work associated with millwork with Section 09 31 00.
  - .12 Install all Owner-supplied equipment and components associated and interfaced with Finish Carpentry and Millwork.
  - .13 Gently arise leading edge of MDF wall base. Mastic-apply.

END OF SECTION





**PART 1 GENERAL**

**1.1 Work Included**

- .1 Exterior wall cavity thermal insulation.
- .2 Rigid thermal insulation.
- .3 Concrete Faced Insulated Wall Panels

**1.2 Related Work**

- .1 Section 01 45 00 Quality Control
- .2 Section 07 21 29 Sprayed Thermal Insulation
- .3 Section 07 27 13 Self-Adhesive Membrane
- .4 Section 07 42 00 Metal Wall Panels
- .5 Section 07 42 43 Composite Wall Panel System
- .6 Section 07 52 00 Modified Bituminous Membrane Roofing
- .7 Section 09 22 00 Non-Structural Metal Framing
- .8 Division 22 Thermal Insulation for Piping
- .9 Division 23 Thermal Insulation for Ducting

**1.3 Submittals**

- .1 All submittals shall be in accordance with Section 01 33 00 – Submittal Procedures.
- .2 Samples: Submit representative samples of each specified insulation material, insulation clips, adhesives, fasteners, tapes and other material for review.
- .3 Manufacturer's Product Data:
  - .1 Submit manufacturer's product data sheets for products proposed for use in the work of this section.
  - .2 Submit data and installation instructions for materials and prefabricated devices, providing descriptions sufficient for identification at the site.
  - .3 Submit data from manufacturer's or independent laboratory indicating compatibility and adhesive results of proposed materials.

**1.4 Reference Standards**

- .1 Model National Energy Code for Buildings (NECB).
- .1 Wall and grade slab assemblies to NECB 2015.

**1.5 MOCKUP**

- .1 Construct one mockup minimum 10 m2 of rigid insulation, including insulation retaining pins, insulation spacers, Zgirts, one inside corner, one outside corner, and one window as requested by the Consultant. Mockup may be part of the finished work.

**PART 2 PRODUCTS**

**2.1 Wall Cavity Rainscreen Thermal Insulation**

- .1 Where indicated at exterior wall rainscreen cavities: dual density, non-combustible, thermal insulation made from basalt rock and slag.
- .2 Product shall comply with CAN/ULC-S702 Type 1 and ASTM C612 Type 1 VB.
- .3 Thicknesses as indicated on drawings.
- .4 Physical properties of the insulation shall meet the following.

**.1 Fire Performance:**

ASTM E136	Behaviour of Materials at 750C	Non-Combustible
CAN4 S114	Test for Non-Combustibility	Non-Combustible
ASTM E84 (UL 723)	Surface Burning Characteristics	Flame Spread = 0 Smoke Developed = 0

**.2 Water Vapour Permeance:**

ASTM E96	Water Vapour Transmission, (Desiccant Method)	1555 ng/Pa.s.m <sup>2</sup> (27.2 perm)
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**.3 Moisture Resistance:**

ASTM C518 (C177)	Moisture Sorption	0.07%
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**.4 Thermal Resistance:**

ASTM C518 (C177)	R-value/inch @ 75°F	4.3 hr.ft <sup>2</sup> .F/Btu***
	RSI value/25.4 mm @ 24°C	0.76 m <sup>2</sup> K/W

**.5 Fungi Resistance:**

ASTM C1338	Mold Growth	Zero Growth
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**.6 Density:**

ASTM C612-00 – Actual outer layer	100 kg/m <sup>3</sup>
Inner Layer (2.5" board)	65 kg/m <sup>3</sup>
Inner Layer (5.0" board)	55 kg/m <sup>3</sup>

- .5 Accepted product: Roxul “Cavity Rock DD”. (“Cavity Rock DD Plus” where roofing membrane attaches to insulation). Other products having the same characteristics will not be excluded.

## 2.2 Thermal Batt Insulation for Metal Studs and Framing

- .1 Friction-fit mineral wool fibre blankets, made from basalt rock and slag, thickness as noted on drawings, width-sized to fit metal studs and framing at 16” o.c. (or as otherwise indicated) and possessing the following characteristics:
- |                           |   |   |
|---------------------------|---|---|
| .1 CAN/ULC-S702-97        | Thermal Insulation Mineral Fibre for Buildings  | Type 1, Complies                        |
| .2 CAN4-S114              | Determination of Non-Combustibility   | Non-Combustible                         |
| .3 CAN/ULC S102           | Surface Burning Characteristics   | Flame Spread = 0<br>Smoke Developed = 0 |
| .4 CCM Evaluation Listing | MasterFormat 07210: Mineral Fibre Batt Insulation   | 12018-L                                 |
| .5 Density                | (32 kg/m <sup>3</sup> ) meets NBC/ULC Standards of CAN/ULC-S702-97<br>4.8 kg/m <sup>2</sup> @ 150mm<br>2.8 kg/m <sup>2</sup> @ 89mm<br>2.0 kg/m <sup>2</sup> @ 65mm |   |
- .2 Thermal resistance rating: R22 for 140 mm wood stud walls, and as otherwise indicated.
- .3 Accepted product: Roxul Building Insulation.

## 2.3 Rigid Thermal Insulation

- .1 Extruded polystyrene insulation panels, purpose made for scheduled use including below slab and foundation perimeter insulation, conforming to CAN/ULC-S701 Type 4, ship lapped edges, and meeting the values of the following table of properties:

Property and Test Method	Value
Thermal Resistance per 25 mm ASTM C518 @ 24°C mean Temp., m <sup>2</sup> •°C/W min., R-value (RSI)	5.0 (.87)
Compressive Strength <sup>(1)</sup> , ASTM D1621, kPa, min.	210
Water Absorption, ASTM D2842, % by volume, max.	<0.7
Water Vapour Permeance, ASTM E96, perm (ng/Pa•s•m <sup>2</sup> )	0.9 (50)
Maximum Use Temperature °C	74
Coefficient of Linear Thermal Expansion, ASTM D696, mm/m•°C	6.3 x 10 <sup>-2</sup>

- .2 Use high density (structural grade) material (210 kPa) below floor slab and imposed loads.
- .3 Where perimeter foundation wall insulation is exposed above grade, use proprietary branded extruded polystyrene with factory-bonded fibre cement board on exposed face.

**2.3 Concrete Faced Insulated Wall Panels**

- .1 Latex modified concrete facing, bonded to rigid polystyrene foam insulation backing, with related flashings and accessory components, conforming to:
  - .1 CAN/ULC-S701, Standard for Thermal Insulations, Polystyrene, Boards and Pipe Covering.
  - .2 CAN/ULC-S102, Standard Method of Test for Surface Burning Characteristics of Building Materials and Assemblies.

Property and Test Method	Value
Thermal Resistance per 25 mm ASTM C518, R-value (RSI)	5.0 (.87)
Compressive Strength <sup>(1)</sup> , ASTM D1621, kPa, min.	240
Water Absorption, ASTM D2842, % by volume, max.	<0.7
Water Vapour Permeance, ASTM E96, perm	0.8 (50)

- .2 Accepted product: Tech-Crete Processors Ltd., CFI®Wall Panel, in modular sections, website: www.tech-crete.com, Telephone: 250-832-9705. Other products having the same characteristics will not be excluded.
- .3 Wall Panel Attachment: Galvanized Steel: ASTM A123/A123M-08 - Zinc-Coated (Galvanized), G200, or Galvalume AZM 150 coating designation, preformed as supplied by manufacturer, complete with corrosion proof masonry fasteners. For small areas, use a suitable exterior-rated construction adhesive instead of fasteners.

**PART 3 EXECUTION**

**3.1 Installation of Cavity Thermal Insulation**

- .1 To thoroughly dry surface of sheathing membrane (Section 07 27 13) on exterior wall sheathing or masonry of rain screen cavity: apply insulation board using methods (including minimal mechanical fastening) as recommended by membrane and insulation manufacturers.
- .2 Cut and trim insulation neatly to fit spaces. Use largest possible dimensions to reduce number of joints. Rigid boards that are not tight fitting will not be accepted. Consultant will identify nontight fitting insulation for replacement.
- .3 Insulation is to be within 3mm of the surface of the self-adhered membrane. No gaps in the insulation is permitted that exceed 3mm and should generally be snug fitting at seams and joints.

**3.2 Batt Insulation Installation**

- .1 Install insulation, in thicknesses as indicated, in such manner as to maintain continuity of thermal and acoustical protection to building elements and spaces. Fit insulation closely around electrical boxes, pipes, ducts, frames and other objects in or passing through insulation.
- .2 Do not compress insulation to fit into spaces.
- .3 Overlap thermal insulation sufficiently to maintain continuity.

- .4 Loose-fill all exterior hollow metal door frames with thermal batt insulation.

**3.3 Concrete Faced Insulated Wall Panels**

- .1 Install per architectural details and manufacturer's recommendations.
- .2 Dado corner joints to conceal insulation.

END OF SECTION



## **PART 1 GENERAL**

### **1.1 Section Includes**

- .1 All materials, labour, equipment and services required for the manufacture and installation of spray-applied polyurethane combination thermal insulation/air barrier system to building envelope elements where indicated, detailed and required.

### **1.2 Related Sections**

- .1 Section 01 35 33 Health and Safety Requirements
- .2 Section 01 35 43 Environmental Procedures
- .3 Section 01 45 00 Quality Control
- .4 Section 07 21 00 Building Insulation
- .5 Section 07 27 13 Self-Adhesive Membrane
- .6 Section 07 52 00 Modified Bituminous Membrane Roofing

### **1.3 References**

- .1 Health Canada / Workplace Hazardous Materials Information System (WHMIS)
  - .1 Material Safety Data Sheets (MSDS).
- .2 Underwriter's Laboratories of Canada (ULC) (latest editions)
  - .1 CAN-ULC-S705.1-98: Standard regarding rigid polyurethane foam spray thermal insulation, intermediate density – materials specifications.
  - .2 CAN-ULC-S705.2-98: Standard regarding rigid polyurethane foam spray thermal insulation, intermediate density – installer responsibilities.
- .3 Publications of the Canadian Urethane Foam Contractor Association (CUFCA).
- .4 National Building Code of Canada (NBCC), 2015.
- .5 Model National Energy Code for Buildings (NECB)
  - .1 Wall and grade slab assemblies to NECB 2015.

### **1.4 Submittals**

- .1 Submit in compliance with Section 01 33 00, the results of all tests conducted in order to verify if the quality of the insulation material is equal or superior to the requirements outlined in this section.
- .2 Submit the results of all CCMC air barrier systems tests approved according to the CCMC's Technical Manual #07272 conducted in order to prove that the air barrier system meets National Building Code (2010) requirements.
- .3 Product Data Sheets:
  - .1 Submit manufacturer's Product data sheets for Products proposed for use in the work of this section.

### **1.5 Mock-Ups**

- .1 Create samples that are in compliance with Section 01 33 00.
- .2 Create a sample of 5 m<sup>2</sup> minimum, showing both inner and outer corners. This sample may be part of the completed structure.
- .3 Using the polyurethane foam insulation sample that was sprayed in place, the following trials must be conducted on site, as required by the Canadian Urethane Foam Contractor Association (CUFCA):
  - .1 Verify core density.

- .2 Verify adhesion between any transition membranes and the substrate.
- .3 Verify cohesion/adhesion between the insulation material and the substrate.
- .4 Ensure results are in compliance and enter them in the CUFCA daily report.

#### **1.6 Protective Measures**

- .1 Ensure the work area is adequately ventilated, in compliance with requirements set out in Sections 01 35 43 and 01 51 00 as well as WCB and WHMIS regulations.
- .2 Ensure continuous ventilation of the work area, through a fresh air intake and the extraction of foul air, during the course of the application process and for 24 hours thereafter.
- .3 Install temporary partitions in order to prevent any effect on the ambient air – outside of the work area – from the sprayed on insulation material.
- .4 Ensure all structures are well protected, in accordance with the manufacturer's recommendations.
- .5 Protect all adjacent surfaces and equipment against any damage that may be caused by dispersion and overspray of insulation material beyond prescribed limits.
- .6 All remaining foam particles must be flushed out of the spray gun on a daily basis. This procedure must be performed in areas designated for this purpose, and the contents of the empty containers neutralized accordingly to the procedure established by the CUFCA and other authorities having jurisdiction.

#### **1.7 Delivery, Storage and Handling**

- .1 Ensure that application equipment and packaged material can be accommodated by helicopter and door, hatch and corridor dimensions.
- .2 All materials shall be delivered and stored in their original packaging bearing the manufacturer's name, quantity, CCMC numbers, and other appropriate technical indicators or references. The expiry date must also appear on the containers.
- .3 Store materials above ground, in a dry location, protected from weather, moisture and areas of high humidity. Damaged packages found unsuitable for use will be rejected and removed from the project.

#### **1.8 Quality Assurance**

- .1 The insulating material shall be applied by a company and personnel who are certified by the material manufacturer and CUFCA or the National Energy Conservation Association (NECA). These certified individuals must have their certification cards in their possession and available for presentation upon request.
- .2 Copies of the material manufacturer's and CUFCA installation manuals for the application of sprayed on polyurethane foam shall be kept on site.
- .3 Tests shall be conducted daily on both core density and cohesion/adhesion to the substrate, following procedures established by CUFCA/NECA. The results of these tests shall be entered in the daily report forms provided by CUFCA/NECA.
- .4 Adhesion tests shall be conducted on all corners, as well as the wall/slab intersections. Do one test on every wall that is less than 30 meters in length.
- .5 Verify the adhesion of any transition self-adhesive membranes at the perimeters of all openings.
- .6 Access to the jobsite by any material manufacturer's or CUFCA/NECA representative shall be permitted for the purposes of technical assistance or verifying operator certification or the quality of the polyurethane foam application.



### **1.9 Environmental Conditions**

- .1 Only spray the insulating material if the surface and ambient air temperatures are within the manufacturer's prescribed limits. i.e., -10°C to +40°C.
- .2 Surfaces to be covered with polyurethane foam must be clean and dry, as required by CAN/ULC-S705.2. Since adhesion of the polyurethane foam is of the utmost importance, the substrate must be free of all frost, dust, oil, grease, oxidization, or any other element that may affect this property, nor should it present a high moisture content.
- .3 Metallic surfaces shall be checked to ensure no oxidization has occurred. Use of a primer is strongly recommended. Refer to the CUFCA manual.

### **1.10 Performance Requirements**

- .1 Long Term Thermal Resistance LTRR: Tested by an independent laboratory in accordance with CAN/ULC S770-03 and achieving the following minimum values at a minimum core density of 28.34 kg/m<sup>3</sup> (1.77 lb/ft<sup>3</sup>):
  - .1 RSI 0.91 per 25 mm @ 50 mm.
  - .2 RSI 0.95 per 25 mm @ 75 mm.
  - .3 RSI 0.98 per 25 mm @ 100 mm.
- .2 Aged r-values based on test methods other than LTRR or at densities lower than specified will not be accepted.
- .3 LTRR-values shall be based on density not less than minimum insitu density.
- .4 Core density shall be confirmed by field testing.

### **1.11 Coordination**

- .1 Coordinate the work of this section with all interfacing sections, especially Section 07 27 13.
- .2 Coordinate with related work to allow for installation of required materials prior to spray insulation. Perform sprayed foam installation to ensure an un-interrupted and complete thermal and air barrier installation.

## **PART 2 PRODUCTS**

### **2.1 Materials**

- .1 Insulation: a spray polyurethane foam listed under CAN.ULC-S705.1, with CCMC #12840-R for insulation and CCMC #1232-R for the air barrier system, according to CCMC technical manual #07272, with the following physical properties:
  - .1 Density (ASTM D-1622) = 30.4 kg/m<sup>3</sup>, minimum Thermal resistance approved by the standard.
  - .2 Dimensional stability (ASTM D-2126), % volume change after 28 days: -0.047% at -20°C, 8.45% at +100°C, 7.64% at +70°C with relative humidity >90±3%.
  - .3 Flame spread classification (CAN.ULC-S102, including S127) = 375.
  - .4 Compressive strength (ASTM D-1621), 10% parallel to rise = 222 kPa.
  - .5 Tensile strength (ASTM D-1623) = 337 kPa.
  - .6 Open cell content (ASTM D-2856) = <1%.
  - .7 Water absorption (ASTM D-2842) by volume = 2.5%.
  - .8 Water vapour permeance (ASTM E-96) = 125 ng/Pa.s.m<sup>2</sup>.
  - .9 VOC during curing: Below detectable limit after 24 hours or during curing.
- .2 Primers: as recommended in the CIFCA/NECA Technical Manual, taking

type and condition of work surfaces.

- .3 An example of an accepted product is "Walltite" Insulation/Air Barrier System by BASF Chemical Co. Other product having the same characteristics will not be excluded.

## **2.2 Compatibility**

- .1 Ensure that materials used are compatible with all interfacing materials. Obtain confirmation from sprayed foam insulation manufacturer.
- .2 Provide written proof of compatibility.

## **PART 3 EXECUTION**

### **3.1 Manufacturer's Instructions**

- .1 Follow the manufacturer's written instructions when spraying the polyurethane foam. Refer to manufacturer's technical product documentation, application guide section.
- .2 The manufacturer's recommendations shall be followed with regard to outside air temperature and substrate conditions (refer to manufacturer's data).
- .3 Spraying shall be done using a positive displacement pump with preset ratios specially designed for use with rigid polyurethane foam. Follow the directions for use and the cleaning and maintenance procedures set out in the equipment manufacturer's manual.

### **3.2 Examination**

- .1 Verify existing conditions before commencing work.
- .2 Verify that substrate is free of any foreign material that will impede application.
- .3 Verify that other work on and within spaces to be insulated is complete prior to application.
- .4 Notify Consultant of conditions that would adversely affect the application.
- .5 Commencement of installation implies applicator accepts existing conditions.

### **3.3 Preparation**

- .1 Comply with manufacturer's written installation instructions for preparing substrates indicated to receive sprayed insulation.
- .2 Mask and protect adjacent surfaces from overspray or damage.
- .3 Remove foreign materials, dirt, grease, oil, paint, laitance, efflorescence, and other substances that will affect application.

### **3.4 Application**

- .1 Apply insulation to building envelope elements where indicated on drawings and reasonably required.
- .2 Spray the foam in consecutive layers of no less than 12.5 mm and no more than 50 mm thick each, for a total thickness as indicated on drawings.
- .3 Cover all excessively wide joints prior to application of polyurethane foam insulation.
- .4 Spray apply polyurethane foam with a tolerance of +6/-0 mm in relation to the specified thickness.
- .5 When spraying polyurethane foam, avoid the formation of sub-layer air pockets.
- .6 Avoid spraying the foam on any surfaces other than those indicated. Use dropsheets or masking tape to protect other surfaces.
- .7 Once the foam has hardened, remove all overspray from non-prescribed surfaces while at the same time taking care not to damage them.

- .8 Do not allow polyurethane foam, once applied, to be damaged during work by other trades, unless prior agreement has been reached.
- .9 Ensure the subsequent coverage of the applied insulating foam will be completed within the manufacturer's prescribed time frame. Refer to manufacturer's technical product documentation.
- .10 Spray apply the polyurethane foam in overlapping layers, so as to obtain a smooth, uniform surfaces.
- .11 In cold weather when applying on a flat surface of more than 15 lineal meters in either direction, apply the first layer in 3 meter strips at 1 meter intervals. After the curing period ( $\pm 4$  hours) has elapsed, spray the polyurethane foam on the unfilled spaces.
- .12 Do not spray polyurethane foam any closer than 75 mm from chimneys, heating vents, steam pipes, recessed lighting fixtures, and other heat sources. Do not spray the insides of any exit openings or electrical junction boxes (refer to the CUFCA/NECA manual).
- .13 Cover all mechanical fixtures and electrical boxes with polyurethane foam in order to reduce thermal bridging.
- .14 Completely fill voids between metal stud flanges and exterior concrete walls with sprayed thermal insulation.
- .15 Leave sprayed thermal insulation ready for covering with drywall at walls and sprayed fire resistive crust at soffits.

### **3.5 Field Quality Control**

- .1 Inspect application for insulation thickness and density. Rectify deficiencies.

### **3.6 Protection and Cleaning**

- .1 Do not permit subsequent work to disturb applied insulation.
- .2 As work proceeds and on completion, clean up and remove from the premises all rubbish and surplus materials resulting from this work.

END OF SECTION



**PART 1 GENERAL**

**1.1 Work Included**

- .1 Sheet-applied self-adhesive combination air/vapour barrier sheathing and flashing/transition membrane at rain screen cavity assemblies.
- .2 Sheet-applied self-adhesive foil-faced membrane flashing required to provide continuity detailing at interruptions in wall envelope such as fenestration.
- .3 Liquid-applied flashing membrane as a wall penetration and detailing sealant.

**1.2 Related Work**

- .1 Section 01 45 00 Quality Control
- .2 Section 06 10 00 Rough Carpentry
- .3 Section 07 42 43 Composite Wall Panel System
- .4 Section 07 52 00 Modified Bituminous Membrane Roofing
- .5 Section 07 62 00 Sheetmetal Flashing and Trim
- .6 Section 08 44 00 Aluminum Curtainwall

**1.3 Quality Assurance**

- .1 Qualifications: Work of this section shall be executed by competent installers with minimum 5 years experience in application of products, systems and assemblies specified and with approval and training of product manufacturer.
- .2 Conduct quality control in accordance with Section 01 45 00.
- .3 All sealants, primers, mastics and adhesives associated with the sheathing membrane shall be products of said sheathing membrane manufacturer.

**1.4 Submittals**

- .1 All submittals shall be in accordance with Section 01 33 00 – Submittal Procedures.
- .2 Product data sheets:
  - .1 Submit manufacturer's product data sheets for products proposed for use in the work of this section.
- .3 Mock-up:
  - .1 Construct minimum 10 m<sup>2</sup> area of wall assembly if requested.
  - .2 Locate at the place of work as part of final installation. Space installation to include exterior wall panel incorporating window, glazing system and installation.
  - .3 Do not proceed until mock-up has been reviewed by the Consultant.
- .4 Samples:
  - .1 At the Consultant's request, samples of materials shall be submitted for approval, prior to commencing work concerned.

**1.5 Product Delivery, Storage and Handling**

- .1 Deliver and store all materials in their original packaging in undamaged condition, sealed with labels intact, having manufacturer's name, brand, weight, CSA and other references to accepted standards clearly shown.
- .2 Make all necessary arrangements with regard to delivery and storage on the site with the

Departmental Representative and schedule deliveries accordingly. In general, deliver material as required for installation and keep site storage to a minimum.

- .3 Provide all plant and equipment necessary for off-loading of materials to complete the work of this section.
- .4 Protect materials from damage, weather and store in a dry place.
- .5 Handle materials and equipment in strict accordance with manufacturer's recommendations. Damaged or deteriorated materials shall be removed from premises.

#### **1.6 Job Conditions**

- .1 Conform to membrane manufacturer's requirements for minimum application temperatures and humidity. Check surfaces and areas specified and shown to receive membrane.
- .2 Report any unsatisfactory conditions and/or surfaces to the Consultant in writing. Starting work shall imply acceptance of surfaces and conditions.
- .3 Take all necessary measurements and levels at the building. The work shall be laid out to accurately fit the conditions at the building and with adjacent work.
- .4 Notify the Consultant of any variations beyond the accepted tolerances in the substrate or in the adjacent work, including membrane roofing (Section 07 52 00).
- .5 Provide forced air circulation during curing period for enclosed applications.
- .6 Low temperature application:
  - .1 Perform adhesion test for membrane when ambient temperature is below -5°C. Sheathing membrane manufacturer must produce both "summer" and "winter" (low temp.) grades.
  - .2 Proceed with work when temperature is (or predicted) to fall below -5°C ambient temperature only with the mutual documented agreement of inspection and testing company, manufacturer and applicator.
- .7 Do not perform installation during rainy or inclement weather or on wet or frost covered surfaces.
- .8 Provide temporary protection of the applied membrane to prevent mechanical damage or damage from spillage of oil or solvents.

#### **1.7 Performance Requirements**

- .1 Sheathing membrane system shall perform as a continuous air barrier and liquid water drainage plane flashed to discharge incidental condensation or water penetration to the exterior of the building envelope.
- .2 The membrane flashing/universal transition membrane shall perform as flashing by providing continuity at interruptions in sheathing systems caused by openings in building structure and interfacing with other elements and systems. The membrane system is also employed as a transition membrane between envelope components and other membranes and waterproofing systems. Ensure compatibility between systems.
- .3 All self-adhesive membrane systems shall accommodate substrate movement, construction material changes, and transitions at perimeter conditions without deterioration and air leakage exceeding the specified limits and requirements, or interruption of the drainage plane.
- .4 The sheathing membrane shall comply with the following criteria and values:
  - .1 Air permeance: Maximum 0.0005 L/s m<sup>2</sup> at 75 Pa (0.00001 cfm/ft<sup>2</sup> at 1.57 psf) to

- ASTM E2178-03
- .2 Must pass ASTM 2357 air leakage resistance criteria.
  - .3 Water vapour transmission: <0.90 ng/pa\*s•m2 (<0.016 perm) to ASTM E96 (Procedure 'B').
  - .4 Peel resistance: 2800 N/m (16 lb/in) to ASTM D903.
  - .5 Low temperature flexibility: -35°C (-31°F) to ASTM D5147.
  - .5 Air barrier systems shall be joined in an airtight and flexible manner to air barrier material of adjacent building envelope systems, employing transition membrane, allowing for relative movement of systems due to thermal and moisture variations and creep. Connection shall be made between the following unless otherwise applicable:
    - .1 Foundation and walls.
    - .2 Walls and openings (windows, doors, louvers, and other wall penetrations).
    - .3 Different wall systems.
    - .4 Wall and roof.
    - .5 Wall and roof over non-climate controlled space.
    - .6 Walls, floor and roof across construction, control, and expansion joints.
    - .7 Walls, floors and roof to utility, pipe and duct penetrations.
  - .6 Provide temporary protection of the applied membrane to prevent mechanical damage or damage from spillage of oil or solvents.

## **PART 2 PRODUCTS**

### **2.1 Vapour-Permeable Sheathing Membrane**

- .1 Description: self-adhesive membrane composed of a tri-layer laminated polypropylene facer
- .2 Acceptable Products: Soprema SopraSeal Stick VP, or similar

### **2.2 Self-Adhesive Flashing/Transition Membrane**

- .1 Description: Self-adhering modified bituminous membrane system consisting of SBS modified bitumen and a tri-laminated woven polyethylene facer. The underface shall be covered with a silicone release paper or film. Membrane shall be available in "summer" and "winter" grades and shall comply with the following physical properties:
  - .1 Thickness: 1.0 mm (40 mils) minimum.
  - .2 Application temperature: as per manufacturer's printed installation instructions.
  - .3 Min. tensile strength to ASTM D5147: 11.3/15.4 kN/m (64/88 lb/in).
  - .4 Min. tensile strength to ASTM D412: 11.2/31.1 MPa.
  - .5 Static puncture: 400 N (90 lb) to ASTM D5602; 747 N (168 lb) to ASTM E154.
- .2 Primer: as manufactured by membrane manufacturer specifically for membrane.
- .3 Termination mastic: as recommended by membrane manufacturer.
- .4 Ensure that self-adhering membrane is compatible with and will adhere permanently to all interfacing substrate materials and systems, including foil-faced membrane (2.2) and Membrane Roofing (Section 07 52 00).
- .5 If required by the Consultant, demonstrate accelerated long term adhesion to all substrate appropriate to this Project. Refer to Section 01 45 00.

- .6 Acceptable Products:
  - .1 Protecto Wrap “100/40”
  - .2 Grace Construction Products ‘Perm-A-Barrier Wall Membrane’.
  - .3 Soprema ‘Soprseal Stick 1100T Summer Grade and Winter Grade with ‘Elastocol Stick’ primer.
  - .4 “HT”-designated high-temperature membrane for high-temperature applications (e.g. parapet cap flashings): Lastobond Shield HT by Soprema, or Blueskin PE 200 HT by Monsey-Bakor.

## **2.2 Self-Adhesive Foil-Faced Membrane Flashing**

- .1 Multi-purpose, self-adhering detailing membrane for use at door/window openings, vents and other interruptions in the wall membrane system.
- .2 Membrane shall be composed of a proprietary base fabric/film laminated to an aluminum foil and available in various roll widths.
- .3 Acceptable products:
  - .1 ‘Protector Seal 45” by Protecto Wrap.
  - .2 “Sopra Solin HD” by Soprema.
  - .3 Other products with similar characteristics and proven long term adhesion to moist substrates will not be excluded.

## **2.3 Liquid-Applied Flashing Membrane**

- .1 Liquid-applied flashing membrane for use as a sealant at penetrations to the wall sheathing membrane, as a detailing sealant and as noted and detailed.
- .2 Material shall be a gun grade waterproofing, adhesive and detailing compound composed of 99% solids, roller/trowel/brush applied, single component, high performance, elastomeric, silyl-terminated polyester coating/sealant exhibiting the combined benefits of silicone and urethane. Product shall meet all current VOC requirements and contain no solvents or isocyanates.
- .3 Liquid-applied flashing system shall comply with the following properties when cured:
  - .1 Hardness, Shore A 40—45
  - .2 Tensile Strength 180 Psi
  - .3 Elongation at Break 400%
  - .4 Peel Strength 25 pli
  - .5 Accelerated Weathering Must Pass
  - .6 Water Vapour Transmission 14 perms @ 12 mils
  - .7 Surface Burning ASTM E84 Flame Spread: 0  
Smoke Developed: 15  
NFPA and ICC Class A Building Material
- .4 Uncured properties:
  - .1 Tack Free Time <30 minutes
  - .2 Cure Rate 3/16 inch/24 hours
  - .3 Volatile Organic Content 1.5% by wt.  
27 g/Lt .2 lbs/gal
  - .4 Water Vapour Transmission 6.34 grains/hour/Ft<sup>2</sup>



- .5 An example of the accepted product is "R-Guard Fast Flash" as manufactured by Prosoco. Other products having the same demonstratable characteristics will not be excluded.

## **2.4 Accessories**

- .1 Termination Bar: Minimum 18 Ga. steel, or 1/16" aluminium. Material G200 galvanized steel or aluminium. Size 1.5" (38 mm) wide x continuous lengths where possible. Install gum lip, where applicable.

## **PART 3 EXECUTION**

### **3.1 Preparation**

- .1 Preparation of all surfaces to receive self-adhering membranes including substrate, joints, cracks, coves etc. shall be carried out in accordance with manufacturer's written directions.
- .2 Ensure that all substrate surfaces are smooth, dry and firm. Remove any frost, ice, loose particles, ridges, laitance, cracks, grease, asphalt, oil and other foreign matter which could prevent adhesion of the membrane to the substrate.
- .3 Do not install membranes until other work which penetrates membrane has been completed.
- .4 Seal around membrane penetrating elements in accordance with manufacturer's printed installation instructions.

### **3.2 Priming**

- .1 All surfaces to receive self-adhering membrane shall be primed at the rate recommended by the manufacturer. Primer shall be uniformly applied.
- .2 Open time of 30 minutes shall be allowed before installation of self-adhering membrane.

### **3.3 Sheathing Membrane Installation**

- .1 Install membrane in accordance with manufacturer's printed instructions over flashings and corner reinforcement.
- .2 Begin installation at the base of the wall placing top edge of membrane immediately below materials protruding from substrate.
- .3 When properly positioned, place against surface by pressing firmly into place. Roll membrane with extension-handled countertop roller immediately after placement.
- .4 Overlap horizontally-adjacent pieces 50 mm and roll seams.
- .5 Vertical laps shall be 150mm overlap. 300mm overlaps at corners.
- .6 Bottom edge shall be slit to fit around penetrations. Membrane shall overlap the membrane sheet below by 50 mm. Roll firmly into place.
- .7 Seal around materials penetrating membrane with termination mastic. At end of each working day, seal top edge of membrane to substrate with termination mastic.
- .8 Do not allow the rubberized asphalt surface of membrane to come in contact with polysulfide sealants, creosote, uncured coal tar products or EPDM.
- .9 Do not expose membrane to sunlight for more than thirty days prior to enclosure.
- .10 Apply a bead or towel coat of mastic along membrane edges, seams, cuts, and penetrations.
- .11 Roll membrane with 75 mm wide hand roller.

- .12 Tie into adjacent wall systems and roof systems for continuous air barrier at building envelope.
- .13 Flashing and Corner Reinforcing:
  - .1 Where applicable, bring flashing a minimum of 150 mm onto horizontal surfaces and a minimum of 200 mm up walls from horizontal elevation shown.
  - .2 Stagger flashing and membrane seams.
  - .3 Install flashing to protrusions, expansion joints, control joints and the like. Bring flashing a minimum of 150 mm onto the membrane.
  - .4 Wrap air barrier membrane into jambs and sills at openings. Terminate membrane at points that will prevent visibility from interior.
- .14 Inspection: Inspect membrane for punctures, misaligned seams and fishmouths, apply additional layer of membrane over affected area, extending minimum of 150 mm beyond damaged area in all directions.
- .15 Coordinate proper construction of the roof/wall intersection to maintain the continuity of the air barrier system from the wall to the roofing membrane system.

### **3.4 Transition/Flashing and Foil-Faced Membrane Installation**

- .1 Apply self-adhering "detailing" membranes to surfaces as indicated on drawings and as specified.
- .2 Application of membrane, including temperature limitations, curing requirements and all other application procedures shall be carried out in accordance with membrane manufacturer's written directions.
- .3 Coordinate proper construction of roof/wall junctions between Section 07 27 13 and interfacing materials and systems so as to maintain continuity of the air barrier from wall to roof.
- .4 Cut and seal membrane around protrusions to form tight air seal.
- .5 Apply trowelled bead of mastic to all terminations at end of each day's work.
- .6 Inspect membrane thoroughly before being covered and make any corrections immediately. Misaligned or inadequately capped seams, punctures or other damage shall be repaired by patching and sealing with membrane manufacturer's directions.
- .7 Adhere transition membrane to sheathing membrane at wall openings and flash into pckets of fenestration, louvers and doors as detailed, taking extra care to ensure continuity of the air/vapour barrier.
- .8 Membrane shall be continuously supported.
- .9 Extend all membrane patches a minimum 150 mm from repair location or penetration. Seal all around patch with mastic.
- .10 Seal all side laps without factory bitumen edge and all top laps with mastic.
- .11 Fill all joints or gaps wider than 6 mm with foam backer rod and apply 300 mm piece of membrane over joints prior to application of the field membrane.
- .12 Coordinate installation of membrane with other interfacing Sections to minimize exposure of membrane.
- .13 When self-adhering membrane interfaces with incompatible membranes, ensure that bond is made only to bridge membranes.

### **3.5 Liquid-Applied Flashing Membrane Application**

- .1 At penetrations to all self-adhered wall sheathing and transition membranes: Apply liquid-applied flashing system onto foil-faced self-adhered membrane in strict accordance with manufacturer's printed instructions by brush, roller or towel between ambient temperatures of +1°C and 30°C.

### **3.6 Adjust and Clean**

- .1 Repair, remove and clean all smears on exposed finished surfaces or surfaces to be subsequently finished. Clean off immediately as directed by and to the satisfaction of the Consultant. Protect all adjacent surfaces from damage due to self-adhered membrane operations. As work proceeds and on completion, clean up and remove from the premises all rubbish and surplus materials resulting from this work.

END OF SECTION



**PART 1 GENERAL**

**1.1 Work Included**

- .1 Furnish all materials, labour, equipment and services, necessary for the detailed design, erection drawings, shop drawings, fabrication and erection of the dry joint factory-formed/pre-finished zinc alloy wall panel system component of a pressure equalized rainscreen assembly, and cap flashings at parapets & guardwalls.
- .2 Include all concealed fastening, sealants, required sub-framing and matching flashing and accessories.

**1.2 Related Sections**

- |    |                  |                              |
|----|------------------|------------------------------|
| .1 | Section 01 45 00 | Quality Control              |
| .1 | Section 06 10 00 | Rough Carpentry              |
| .2 | Section 07 13 00 | Self-Adhesive Membrane       |
| .3 | Section 07 21 00 | Insulation                   |
| .1 | Section 07 42 43 | Composite Wall Panel System  |
| .4 | Section 07 62 00 | Sheetmetal Flashing and Trim |
| .5 | Section 07 90 00 | Sealants                     |
| .1 | Section 08 44 00 | Aluminum Curtainwall         |

**1.3 References**

- .1 Roofing Practices Manual as published by the Roofing Contractor's Association of British Columbia (RCABC).
- .2 Sheet Metal and Air Conditioning Contractor's National Association, Inc., "Architectural Sheet Metal Manual" (SMACNA).
- .3 ASTM B32 – Standard Specification for Solder Metal.
- .4 ASTM D968 – Standard Test Methods for Abrasion Resistance of Organic coatings by Falling Abrasive.
- .5 ASTM E96 – Standard Test methods for Water Vapor Transmission of Materials.
- .6 Canadian Sheet Steel Building Institute (CSSBI) Technical Bulletins No. 5, 6, 7 and CSSBI Standards for Sheet Metal Cladding.
- .7 NBCC (2015)..

**1.4 Submittals & Specialty Engineering**

- .1 Submit product data, shop/erection drawings and samples in accordance with Section 01 33 00.
- .2 Shop Drawings:
  - .1 Submit shop details and erection drawings in accordance with Section 01 33 00. Shop drawings shall be sealed by a professional Engineer registered in British Columbia, referred herein as "Specialty Engineer".

- .2 Indicate materials, core thicknesses, profiles, dimensions, finishes, connections, joints, method of anchorage, number of anchors, supports, reinforcements, details, and accessories.
  - .3 Letters of Assurance: the Engineer who seals the shop drawings submission shall submit an APEGBC Model Schedule S-B: Assurance of Professional Design and Commitment for Field Review, and Model Schedule S-C: Assurance of Professional Field Review and Compliance by supporting registered professional (SRP).
  - .4 Where metal wall cladding and associated components interface with equipment and other building elements, this section shall be responsible of obtaining all measurements of said items prior to preparation of shop drawings.
- .3 Samples:
- .1 Submit to Consultant for approval prior to fabrication: Representative sample of sufficient scope and size to demonstrate panel profile, corner treatment and joint lap.
  - .2 Provide sample of zinc alloy panel material finish including any portion of panel which has been formed after application of finish for approval by Consultant.
- .4 Product Data:
- .1 Provide manufacturer's printed product literature, specifications, data sheets, qualifications, product test reports, maintenance instructions and sample of standard warranty.

### **1.5 Delivery, Storage, and Handling**

- .1 All materials delivered to the site shall be stored in spaces designed by the Consultant. Materials shall not be exposed to moisture or damage.
- .2 Components and assemblies shall be transported, handled and stored in a manner to prevent damage of any nature. Materials shall be protected as prescribed by cladding manufacturer.
- .3 Delivered materials which are damaged in any way or do not comply with these specifications will be rejected by the Consultant and shall be removed from the job site and replaced with acceptable materials at this Section's expense.

### **1.6 Quality Assurance**

- .1 Installation of pre-formed metal cladding shall be performed by manufacturer-approved installers having at least five years experience in metal cladding installations.

### **1.7 Waste Management and Disposal**

- .1 Separate and recycle waste materials in accordance with Section 01 74 19, Waste Management and disposal.

- .2 Remove from site and dispose of packaging materials at appropriate recycling facilities.
- .3 Collect and separate for disposal: paper, plastic, polystyrene, corrugated cardboard, packing material in appropriate on-site containers for recycling in accordance with Waste Management Plan.

### **1.8 Design Criteria**

- .1 Design wall cladding in accordance with the latest edition of:
  - .1 CAN/CSA-S136 for the Design of Cold Formed Steel Structural Members.
  - .2 Specified loads, load factors and load distributions shall be in accordance with the NBCC 2015 unless otherwise stated.
- .2 Design metal wall cladding system employing "limit states design" method.
- .3 Deflection of cladding is not to exceed 1/90 of the span for live loading as specified in the NBCC 2015.
- .4 Design pre-formed wall cladding system to provide for thermal movement of component materials caused by ambient temperature range of 70°C without causing buckling, failure of seals, leakage and undue stress on fasteners or other detrimental effects.
- .5 Ensure water tightness of wall system is continuous, is sealed at openings and terminations and is overlapped at changes in wall structure.
- .6 Note that most walls to be clad are "exterior" exposure on both sides (un-insulated), but rainscreen principle will still be required.

### **1.9 Compatibility**

- .1 Compatibility between components of cladding system and between cladding system and interfacing components is essential. Provide written declaration to Consultant stating that materials and components, as assembled in system, meet this requirement.

### **1.10 Warranty**

- .1 Warranty Period:
  - .1 Material: 5 years from date of Substantial Completion. (Provided by the Panel Material Manufacturer.
  - .2 Installation: 2 years from date of Substantial Completion. (Provided by the Fabricator/Installer).
  - .3 Failures include, but are not limited to, the following:
    - .1 Structural failures, including rupturing, cracking, or puncturing.
    - .2 Deterioration of metals and other materials beyond normal weathering.

- .3 Oil-canning or buckling due to thermal movement or building structural deflections.

### **1.11 Maintenance**

- .1 Submit the manufacturer's documentation covering the care, cleaning and maintenance of materials for incorporation into maintenance manuals. Ref to Section 01 78 00.

### **1.12 Coordination**

- .1 Coordinate spacing of subgirts to minimize cutting of cavity wall insulation and other interfacing elements.
- .2 Coordinate work of this Section with that of all interfacing Sections.

## **PART 2 PRODUCTS**

### **2.1 Cladding and Cap Flashing Materials**

- .1 All exposed zinc wall panel cladding and associated trim shall be formed to profiles as detailed from zinc alloy composed of minimum 99.8% electrolytic high grade zinc, 0.07 to 0.12% titanium, 0.08 to 0.20% copper and 0.015 aluminum (optional).
- .2 Metal thickness shall be minimum 0.8 mm, but adjusted to accommodate use and span in order to yield a smooth, stiff, non oil-canned surface.
- .3 Finish: pre-weathered zinc. Dark gray zinc with luminance Y between 21 and 26 on exposed side or architect approved equal colour management system. ("Quartz Zinc", "Pre-Weathered Graphite Gray").
- .5 Flashing and trim shall be fabricated from the same materials, thickness and finish as the respective wall cladding.

### **2.2 Cladding & Cap Flashing Profiles**

- .1 Zinc alloy wall and soffit cladding shall be roll-formed from 0.8 mm stock forming 1" deep panels with varying face width as shown on drawings.
- .2 Joints shall be "male-female" tab and slot type as detailed.
- .3 Outside corners shall be folded "Hospital" type.
- .4 Provide corrosion-resistant (G200 galvanized, or AZM 150 Galvalume coating) metal girts and sub-girts of sizes, configuration and placement to accommodate assembly, as detailed, of walls and soffits.



### **2.3 Panel and Trim Fabrication**

- .1 Shop fabricate and finish zinc alloy wall and soffit panels and trim to fulfill requirements in accordance with SMACNA, sheet material manufacturers written instructions, reviewed Shop Drawings, specialty Engineer's directives and Architectural details.
- .2 Form sections square, true and accurate to size, free from distortion and other defects detrimental to appearance or performance.
- .3 Employ bending/breaking and shearing techniques which will cause the least amount of abrasion and damage to the panel-patina/finish. Finish material must be free of draught and die markings.
- .4 Panel bow tolerance: Maximum 1% of panel dimensions, width and length. Provide reinforced panels as required to meet these tolerances.
- .5 Panel Dimensions: Allowance for field adjustments as recommended by material manufacturer, where final dimensions cannot be established by the field measurement before completion of panel manufacturing.
- .6 Panel lines, breaks and angles shall be sharp, true and surfaces free from warp, twist, kinks, dents or buckle.
- .7 Apply minimum 0.2 mm dry film thickness coat of plastic cement or other approved isolation agent to both faces of dissimilar metals in contact.
- .8 Protect dissimilar metals against oxidization by backpainting with isolation coating where indicated.
- .9 Protect / isolate / separate cementitious products from CA / CCA / ACQ-treated wood.
- .9 Closures: same material and finish as face sheet; shop cut and brake formed to details, concealed fastening, hairline exposed joints.

### **2.4 Associated Flashing and Trim**

- .1 Provide all components required for a complete formed metal wall and soffit panel assembly including trim, copings, fascia, sills, corner units, flashings, and similar items.
- .2 All flashing and miscellaneous trim associated with wall panel system shall be fabricated by wall panel supplier from same materials, finish and quality as adjacent wall panels.
- .3 Closures shall be fitted tightly, and all detailing shall be executed neatly in a workmanlike manner to render a complete weatherproof assembly. Refer also to Section 07 62 00.

### **2.5 Girts and Framing**

- .1 Sizes, gauges and spacing of all sub-framing and wall attachment components shall be in strict accordance with approved shop/erection drawings as sealed by the Specialty Engineer.

- .2 Girts shall be non-corrosive metal (G200 galvanized, or AZM 150 Galvalume coating) either hat-shaped, 'C' or 'Z' sections of sufficient width to allow for free air movement in the rain screen cavity.
- .3 All horizontal framing shall be perforated at regular intervals to permit free drainage of cavity.

## **2.6 Fasteners**

- .1 Sizes, material, type and spacing of all fasteners and attachment devices associated with the formed metal wall panel assembly shall be in strict accordance with approved shop/erection drawings as sealed by the Specialty Engineer.
- .2 Fasteners shall be concealed and non-corrosive/non-galvanic with contact materials: stainless steel or 200-hour salt-spray tested.

## **2.7 Metal Protection**

- .1 Where dissimilar metals contact each other or where metals contact other corrosive substrates, protect against galvanic action or metal deterioration with isolation tapes and agents as recommended by metal manufacturer.

## **2.8 Accepted Product**

- .1 "Mini Flush" zinc alloy wall and soffit panels as fabricated and installed by LMC Manufacturing Ltd. of Burnaby, BC. Other products, approved by the Consultant, will not unreasonably be denied.

# **PART 3 EXECUTION**

## **3.1 Examination**

- .1 Examine substrate surfaces to receive formed metal wall and soffit panel system and associated work and the condition in which work will be installed. Do not proceed with work until unsatisfactory conditions have been corrected in a manner acceptable to installer, fabricator, Specialty Engineer and consultant.
- .2 Report any discovered discrepancies to the Consultant so that instructions may be given for the necessary remedial work.

## **3.2 Preparation**

- .1 Prepare substrate surfaces to insure proper and adequate installation in accordance with the contract documents, approved shop drawings, and manufacturer's written requirements and instructions.
- .2 Field measurement and verification of dimensions are required.
- .3 Protect adjacent areas or surfaces from damages as a result of the work in this section.

- .4 Install subgirts, base angles, sills, furring, and other miscellaneous wall panel support members and anchorage according to ASTM C754, Specialty Engineer's written instructions and approved/sealed shop and erection drawings.

### **3.3 Erection General**

- .1 Install formed metal wall and soffit panel systems in strict accordance with panel fabricator's written instructions and approved/sealed shop and erection drawings to produce a complete weatherproof pressure equalized rainscreen assembly.
- .2 Erect panels plumb, true and level and in correct alignment with established lines and elevation shown on approved shop and erection drawings.
- .3 Install all girts, clips, anchors, and flashing securely to surrounding construction spaces to afford maximum rigidity.
- .4 Provide all openings for mechanical and electrical services, piping, louvers, etc., penetrating panels. Provide weathertight flanges, flashings, reinforcing and sealant around all penetrations exposed to the weather and or as shown on the drawings.
- .5 Joints shall not be less than their dimensioned width or more than five percent (5%) greater than their dimensioned width at any location along their full length and shall not be wavy, out of line, or of different width panel to panel.
- .6 Installed panels shall not deviate from overall plane or alignment more than 1/16" in 3'-0". Adjacent panels shall not deviate from plane and alignment by more than 1/32" along their length.

### **3.4 Accessory, Trim and Flashing Installation**

- .1 Install trim, flashing and accessories with positive anchorage to building utilizing weather tight mounting and provision for thermal expansion. Coordinate installation with wall panels and other interfacing components.
- .2 Flashing and Trim: Comply with performance requirements, manufacturer's written installation instructions, and SMACNA's "Architectural Sheet Metal Manual". Provide concealed fasteners, and set units true to line and level as indicated. Install work with laps, joints, and seams that will be permanently watertight and weather resistant.

### **3.5 Field Quality Control**

- .1 The fabricator's professional specialty engineer shall be responsible for periodic inspections during construction as required. Such inspections and associated costs shall be included in the Contract Price.
- .2 At completion of the work, said specialty engineer shall submit to the consultant copies of field review reports for each site visit made and a final signed and sealed letter of assurance of "professional field review" and "compliance" indicating that the copper plate wall panel system has been installed in accordance with the manufacturer's requirements, the standards specified herein and the approved shop drawings.

### **3.6 Clean-Up**

- .1 Remove manufacturer's protective film at appropriate time in advance of the date of substantial performance of the Project. Review concurrently to ensure there is no damage or marring to the wall panels. Replace damaged or marred panels accordingly to the approval of the Consultant.
- .2 Clean panels to remove surface dust, dirt, stains and marks on the panels caused by ambient environmental weather conditions and construction activities. Use cleaners approved by the manufacturers' of surfaces to be cleaned. Protect panels from damage by other trades.
- .3 At completion of the work of this Section, remove any excess materials, debris and equipment, pertaining to the work of this Section, from the site.

END OF SECTION

**PART 1 GENERAL**

**1.1 Work Included**

- .1 Provide all material, labour, equipment and services required for the engineered design, fabrication and installation of factory-finished fiber cementboard panel rainscreen wall system to all areas noted on drawings as "composite wall panel system".
- .2 Include panels and all sub-framing, girts, trim, fixings, anchorage, sealants and tie-in to interfacing building components and weather barriers.

**1.2 Related Sections**

- .1 Section 01 45 00 Quality Control
- .2 Section 06 10 00 Rough Carpentry
- .3 Section 07 27 13 Self-Adhering Membrane
- .4 Section 07 42 13 Zinc Cladding
- .5 Section 07 90 00 Sealants
- .6 Section 07 62 00 Flashing & Sheet Metal
- .7 Section 07 90 00 Sealants
- .8 Section 08 44 00 Aluminum Curtainwall

**1.3 References (Latest Editions of Following)**

- .1 ASTM C-920, Standard Specification for Elastomeric Joint Sealants.
- .2 ASTM C-1185, Standard Test Methods for Sampling and Testing Non-Asbestos Fibre-Cement Flat Sheet, Roofing and Siding Shingles, and Clapboards.
- .3 ASTM C-1186, Standard Specification for Flat Non-Asbestos Fibre Cement Sheets.
- .4 ASTM E-72, Standard Test Methods of Conducting Strength Tests of Panels for Building Construction.
- .5 ASTM E-84, Standard Test Method for Surface Burning Characteristics of Building Materials.
- .6 ASTM E-96, Standard Test Methods for Water Vapour Transmission of Materials.
- .7 ASTM E-136, Standard Test Method for Behaviour of Materials in a Vertical Tube Furnace at 750°C.
- .8 ASTM E228, Standard Test Method for Linear Thermal Expansion of Solid Materials with a Vitreous Silica Dilatometer.
- .9 ASTM G26, Standard Practice for Operating Light-Exposure Apparatus (Xenon-Arc Type) With and Without Water for Exposure of Nonmetallic Materials.
- .10 CAN/CSA S136-07, North American Specification for the Design of Cold-Formed Steel Structural Members.
- .11 CSSBI 50M-87, Lightweight Steel Framing Manual.
- .12 CSSBI 52M-91, Lightweight Steel Framing Binder.
- .13 National Building Code of Canada (NBCC), 2015.

#### **1.4 Submittals**

- .1 All submittals shall be in accordance with Section 01 33 00 – Submittals.
- .2 Product Data: Submit product data sheets.
- .3 Shop Drawings: Submit shop drawings showing layout, profiles, and product components, including edge conditions, panel joints, fixture location, anchorage, accessories, finish colours, patterns and textures. Shop drawings shall also be approved by panel material manufacturer in order to maintain warranty. Shop drawings shall be sealed by a professional engineer (specialty engineer) registered in British Columbia.
- .4 Samples: Submit 200 x 250 mm colour samples for selection by Consultant.
- .5 Quality Assurance Submittals: Submit the following:
  - .1 Test Reports: Submit certified test reports showing compliance with specified performance characteristics and physical properties.
  - .2 Qualification Certificates: Submit certificate indicating compliance with qualification requirements in Quality Assurance article.
  - .3 Product certificates signed by manufacturer certifying materials comply with specified performance characteristics and criteria and physical requirements.
- .6 Manufacturer's installation instruction manual.
- .7 Closeout Submittals: Submit the following:
  - .1 Closeout Submittals (Maintenance Data and Operation Data). Include methods for maintaining installed products and precautions against cleaning materials and methods detrimental to finishes and performance.
  - .2 Warranty: Warranty documents specified herein.

#### **1.5 Quality Assurance**

- .1 Installer shall have a minimum of five (5) years of proven experience in the installation of the specified products on projects of a similar size and scope.
- .2 Fabricator/Installer Qualifications: Installer shall be approved by the panel material manufacturer in writing.
- .3 Install a full wall mock-up on the building in a location as directed by the Consultant.
- .4 Mock-up shall incorporate panels and all accessories including sub-framing, flashing and windows, and may remain as permanent part of building.

#### **1.6 Delivery, Storage and Handling**

- .1 Delivery: Deliver materials in manufacturer's original, unopened, undamaged containers with identification labels intact. .
- .2 Storage and Protection: Store materials protected from exposure to harmful weather conditions, at temperature and humidity conditions recommended by manufacturer.
- .3 Remove damaged materials from site.

#### **1.7 Project Conditions and Coordination**

- .1 Field Measurements: Verify actual measurements/openings by field measurements before fabrication; show recorded measurements on shop drawings. Coordinate field measurements and fabrication schedule with construction progress to avoid construction delays.

- .2 Coordinate work of this section with that of all interfacing component sections.
- .3 Make all penetrations by interfacing sections through panel system, as well as interfacing joints, weathertight.

### **1.8 System Design Requirements**

- .1 Components: Design and size to withstand dead and live loads caused by positive and negative wind pressure acting normal to plane of panel, conforming to NBCC, 2015 for project location climatic conditions.
- .2 Allowable framing deflection: L/175.
- .3 Thermal Movement: Design system to accommodate vertical and horizontal thermal movement of components without causing buckling, failure of joint seals, undue stress on fasteners, and oil canning when subject to seasonal temperature cycling. Systems that accommodate movement with enlarged/slotted attachment holes not accepted.
- .4 Drainage: Design for positive drainage of water leakage and condensation to exterior of wall panel system, including gutter system at each horizontal joint. Systems that do not evacuate water from the cavity at every horizontal will not be accepted.
- .5 Tolerance of Substructure: Design system to accommodate up to 6 mm in 3050 mm variation out of plane. Accommodate tolerances of building structural framing.
- .6 Design entire composite wall panel system to perform as an effective pressure equalized rainscreen conforming to the principles outlined in AAMA 508-07.

### **1.9 Warranty**

- .1 Provide the following warranties:
  - .1 Panel manufacturer's transferable ten (10) year warranty covering defects in materials. (Warranty only available when material installed by certified installation contractor and Shop drawings approved by manufacturer).
  - .2 Panel System Fabricator: 2 year fabrication Warranty for conformance to design and performance and requirements.
  - .3 Installer: 2 year Workmanship Warranty.

## **PART 2 PRODUCTS**

### **2.1 Panel Materials**

- .1 .Cement, silicon-calcium strengthened with a combination of polyvinyl fibers without asbestos, fiberglass or formaldehyde
- .2 Size: 1220mm x 2500mm / 3040mm
- .3 Thickness: 7- 8mm
- .4 Weight: 15kg/m. sq. (3.1 lbs/sq.ft.)
- .5 Must be installed by a Certified Dealer/Installer:
- .6 Fastening: Galvanized/stainless, size and type as recommended by the panel Manufacturer for applicable substrate.
- .7 Factory applied surface treatment to provide complete water repellent properties on all six sides. Used coatings do not contain any solvents.
- .8 Tested to UBC Class 1, NFPA Class A, & Can/ULC S134.
- .9 Less than 2 Delta E unit color change ASTM G155-00 after 2000 hours exposure.
- .10 Reinforcement with only cellulose fibers not acceptable.

- .11 At least 40 year documented panel life expectancy.
- .12 Efflorescence not acceptable.
- .13 Homogeneous smooth semi-matte surface finish
- .14 Tested UV-resistance = Delta E-value < 3 after 2000 hours (Xenon Arc Light acc. Weathering Test according to ASTM G 155-00 [ATI Report]). Product must have the 2000-hour Xenon-Arc test in accordance with ASTM G 155-00 – with a colour resistance E-value of 2-3 on the CIELAB scale
- .15 Temperature resistance guaranteed up to + 80 °C and down to – 40 °C (176 °F to – 40 °F)
- .16 Tensile bending strength corresponds to highest class 5 according to EN 12467.
- .17 Water absorption capacity between 8 M.-% and 12 M.-% °
- .18 High quality reinforcement fibres, the panel must be comprised of < 6 % of cellulose fibres
- .19 Colour as selected by Consultant from manufacturer's standard range and indicated on the Exterior Colour and Finish Schedule.

## **2.2 Subgirts and Framing**

- .1 Sizes, gauges and spacing of all sub-framing and wall attachment components shall be in strict accordance with reviewed shop/erection drawings as sealed by the Specialty Engineer and approved by panel manufacturer.
- .2 Subgirts shall be corrosion resistant (G200 galvanized, or AZM 150 Galvalume coating) metal, either hat-shaped, 'C,' or 'Z' sections of sufficient width to allow for free air movement in the rain screen cavity.
- .3 All horizontal subgirts and framing shall be perforated, prior to galvanization or coating, at regular intervals to permit drainage of cavity where said members extend un-impeded through cavity.

## **2.3 Fastening and Anchorage**

- .1 Provide all required clips, fixings, panel fasteners and framing anchors. Exposed fasteners for panels shall be stainless steel or DT2000 painted, as scheduled. Framing anchors shall be non-thermal bridging of type and size appropriate to substrate as determined by Specialty Engineer.
- .2 Framing Anchors: Subframing Thermal Spacer =100 % Pultruded glass fibre and thermoset polyester resin insulation clip. Cascadia Fiberglass Thermal Spacer available from Cascadia Windows and Doors.
- .3 Sizes, type and spacing of fasteners and attachment devices associated with the composite wall panel assembly shall be in strict accordance with reviewed shop/erection drawings as sealed by the Specialty Engineer, and of material which will minimize thermal bridging.
- .4 All fasteners shall be non-corrosive, non-galvanic, and be compatible with panel materials, finishes and substrate.
- .5 Provide prefinished (to match adjacent cladding) punched/vented metal channel, for venting bottom of rainscreen cavities & soffit cavities, as detailed.

## **2.4 Sealants**

- .1 The supply and application of all required sealants and caulking associated with the composite panel system, including sealing at joints with interfacing materials and systems, shall be by panel fabricator/installer to installation standards as specified in



Section 07 90 00.

- .2 The use of silicone, polysulphide and Thiokol sealant products are prohibited as they can cause permanent staining to composite wall panels.
- .3 Use only compatible sealant products approved by panel manufacturer which include hybrid polymer, polyurethane or acrylic.

## **2.5 Approved Products**

- .1 Swisspearl Cement Composite wall panel system, Sigma 8, distributed by Muralis Architectural.
- .2 Types (ref. elevations & details):
  - .1 Composite Wall Panel 1: Nom. 2500 x 610 / 305mm horizontal running bond  
Reflex 9291 White Satin
  - .2 Composite Wall Panel 2: Max 2500 X various, vertical layup  
Carat 7025 Black Opal
  - .3 Composite Wall Panel 3: Perforated (ref. drawings for pattern)  
Reflex 9291 White Satin
  - .4 Composite Wall Panel 4 (soffit): Nom. 2500 x 610 / 305 running bond with  
Reflex 9291 White Satin  
Cont. demountable access panels in some locations

## **PART 3 EXECUTION**

### **3.1 Examination**

- .1 Examine substrate surfaces to receive composite wall panel system and associated work, and the condition in which work will be installed. Do not proceed with work until unsatisfactory conditions have been corrected in a manner acceptable to installer, manufacturer and Consultant.
- .2 Report any discovered discrepancies to the Consultant so that instructions may be given for the necessary remedial work.

### **3.2 Preparation**

- .1 Prepare substrate surfaces to insure proper and adequate installation in accordance with the contract documents, reviewed shop drawings, and manufacturer's written requirements and instructions.
- .2 Field measurement and verification of dimensions are required.
- .3 Protect adjacent elements and surfaces from damages as a result of the work of this section.
- .4 Install subgirts, base angles, sills, furring, and other miscellaneous wall panel support members and anchorage according to ASTM C754, panel manufacturer's written instructions and reviewed/sealed shop and erection drawings.

### **3.3 Erection General**

- .1 Install composite wall panel system in strict accordance with panel manufacturer's written instructions and reviewed/sealed shop and erection drawings to produce a complete weatherproof pressure equalized rainscreen assembly.
- .2 Erect panels plumb, true and level and in correct alignment with established lines and elevation shown on reviewed shop and erection drawings.
- .3 Install all girts, clips, anchors, and flashing securely to surrounding construction spaced to afford maximum rigidity and minimize thermal bridging.
- .4 Provide all openings for mechanical and electrical services, piping, louvers, etc., which penetrate panels. Provide watertight flanges, flashings, reinforcing and sealant around all penetrations exposed to the weather and or as shown on the drawings.
- .5 Joints shall not be less than their dimensioned width (min. 8 mm) or more than five percent (5) greater than their dimensioned width at any location along their full length and shall not be wavy, out of line or of different width panel to panel.
- .6 Installed panels shall not deviate from overall plane or alignment more than 1.5 mm in 900 mm.
- .7 Keep a minimum distance to corners and edges as recommended by the panel manufacturer.
- .8 Finished installation shall be properly secured, free of rattles, distortions, efflorescence, damaged, or chipped components.

### **3.4 Field Quality Control**

- .1 The manufacturer's or suppliers professional specialty engineer shall be responsible for periodic inspections during construction as required. Such inspections and associated costs shall be included in the Contract.
- .2 Letters of Assurance at completion of work: the Engineer who seals the shop drawings submission shall submit an Assurance of "Structural Design" and Commitment for "Field Review" on Human Resource Development Canada Fire Protection Engineering Services Standard Form Schedule B-1 and B-2. Written inspection reports of field review shall be submitted to the Departmental Representative an Assurance of Field Review and Schedule C-B.
- .3 Provide Schedules S-B: Assurance of professional Design and Commitment for Field Review & S-C: Assurance of Professional Field review and Compliance to the Consultant.

### **3.5 Clean Up**

- .1 Remove manufacturer's protective film at appropriate time in advance of the date of substantial performance of the Project. Review concurrently to ensure there is no damage or marring to the wall panels. Replace damaged or marred panels accordingly to the approval of the Consultant.
- .2 Clean panels to remove surface dust, dirt, stains and marks on the panels caused by ambient environmental weather conditions and construction activities. Use cleaners approved by the manufacturer's of surfaces to be cleaned. Protect panels from damage by other trades.
- .3 At completion of the work of this Section, remove any excess materials, debris and equipment, pertaining to the work of this Section, from the site.

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END OF SECTION



**PART 1 GENERAL**

**1.1 Section Includes**

- .1 All materials, equipment and installation for two-ply elastomeric modified bituminous membrane systems (SBS) to new sloped structure steel decked roofs including combination sheathing board/air/vapour barrier, base and cap plys, associated membrane flashing (stripping plys), and traffic walkways.
- .2 Rigid polyisocyanurate thermal roof insulation, (factory-tapered for crickets, back-slopes and where indicated) and mineral fibre insulation/protection layer.

**1.2 Related Sections**

- .1 Section 01 45 00 Quality Control
- .2 Section 01 74 21 Waste Management & Disposal
- .3 Section 01 78 30 Closeout Submittals
- .4 Section 05 31 00 Steel Decking
- .5 Section 06 10 00 Rough Carpentry
- .6 Section 07 62 00 Sheetmetal Flashing & Trim
- .7 Section 07 90 00 Sealants
- .8 Division 22 Plumbing
- .9 Division 23 Heating, Ventilation & Air Conditioning

**1.3 References**

- .1 The latest version of the following tests and publications:
- .2 American Society for Testing and Materials International (ASTM).
  - .1 ASTM D6162-00a, Standard Specification for Styrene Butadiene Styrene (SBS) Modified Bituminous Sheet Materials Using a Combination of Polyester and Glass Fibre Reinforcements.
- .3 Canadian General Standards Board (CGSB).
  - .1 CGSB 37-GP-56M-80b (A1985), Membrane, Modified, Bituminous, Prefabricated, and Reinforced Roofing.
  - .2 CAN/CGSB-51.33-M89, Vapour Barrier Sheet, Excluding Polyethylene, for Use in Building Construction.
  - .3 CAN/CGSB-37.5-M89, Cutback Asphalt Plastic Cement.
  - .4 CGSB 37-GP-56M-80, Membrane, Modified, Bituminous, Prefabricated, and Reinforced for Roofing.
  - .5 CAN/ULC-S704-03, Thermal Insulation Polyurethane and Polyisocyanurate, Boards, Faced.
- .4 Canadian Roofing Contractors Association (CRCA).
  - .1 CRCA Roofing Specifications Manual – Latest Edition
- .5 Roofing Contractors Association of British Columbia (RCABC).
  - .1 Roofing Practices Manual – Latest Edition
- .6 Department of Justice Canada (Jus).
  - .1 Canadian Environmental Protection Act, 1999 (CEPA)
- .7 Factory Mutual (FM Global).
  - .1 FM Approvals – Roofing Products.
- .8 Health Canada / Workplace Hazardous Materials Information System (WHMIS).

- .1 Material Safety Data Sheets (MSDS).
- .9 National Building Code of Canada, 2010 (NBCC).

#### **1.4 Performance Requirements**

- .1 Compatibility between components of roofing system is essential. Provide written declaration to Owner's Representative stating that materials and components, as assembled in system, meet this requirement.
- .2 The roof assemblies shall have a minimum Class A designation in accordance with NBCC, 2010 (3.1.15.2.1) and ULC S107.

#### **1.5 Submittals**

- .1 All submittals shall be in accordance with Section 01 33 00 – Submittal Procedures.
- .2 Submit two copies of most recent technical roofing components data sheets describing materials' physical properties.
- .3 Submit WHMIS MSDS – Material Safety Data Sheets in accordance with Section 01 35 33 – Health and Safety Requirements.
  - .1 Indicate VOC content for:
    - .1 Primers
    - .2 Asphalt
    - .3 Sealers
    - .4 Tapered Insulation
- .4 Provide layout for factory-tapered insulation.
- .5 Manufacturer's Certificate: certify that products meet or exceed specified requirements.
- .6 Provide to the Owner the "RCABC Roofing System Record" upon completion of the work. Record shall include guarantee, copies of inspection reports and roof maintenance guide.
- .7 Submit copies of underwriter's certification for roof covering materials.

#### **1.6 Quality Assurance**

- .1 Unless otherwise specified, all materials and roofing practice shall conform to the recommendation of the RCABC as contained in their manual, Roofing Practices in British Columbia. Where this manual is silent, the recommendation of the CRCA as contained in their manual Roofing Specifications, shall be followed.
- .2 This Contractor shall at all times, have in his Field Office, a copy of said manuals.
- .3 All work shall be done by a member of the Roofing Contractor's Association of British Columbia and in accordance with the manufacturer's instructions and latest standards of RCABC
- .4 All work of this section shall be installed only by workers, foremen, superintendents and management, whose workmanship is approved by the membrane manufacturer and supplier. Proof of such approval and of the experience of such personnel shall be submitted to the Consultant prior to the start of the work.
- .5 Obtain all roofing materials from the same source to ensure compatibility.
- .6 Roofing and sheet metal work shall be performed in conformance with the roofing manufacturer's written recommendations, as well as the requirements of the ULC laboratories, Factory Mutual FM-190 and CGSB 47-GP-56M (latest).
- .7 The manufacturer of elastomeric bitumen products shall provide proof of ISO9001 Certification.

#### **1.7 Health and Safety**

- .1 Do construction occupational health and safety in accordance with Section 01 35 33 Health and Safety Requirements.

#### **1.8 Product Delivery, Storage & Handling**

- .1 Deliver and store all materials in their original containers in undamaged condition, sealed

- with labels intact, having manufacturer's name, brand, weight, CSA and other references to accepted standards clearly shown.
- .2 Store materials in weatherproof shelters, having floors which will protect the materials from moisture. Store rolled materials on ends. Avoid prolonged exposure of light and heat sensitive materials to sunlight. Remove only as much material from storage as can be applied and made weathertight in the same day.
  - .3 Do not place roof insulation in direct contact with the earth, road surface, or roof deck. Place suitable supports under the insulation upon delivery to protect it from absorbing dampness.
  - .4 Do not store materials in concentrations which exceed design live load.
  - .5 In the event material is damaged by the elements, improper handling or other causes, such material will be rejected and shall be replaced at no extra cost to the Owner's Representative.
  - .6 Place plywood runways over completed Work to enable movement of material and other traffic.
  - .7 Store sealants at +5 degrees C minimum.
  - .8 Handle roofing materials in accordance with manufacturer's written directives, to prevent damage or loss of performance.

#### **1.9 Protection**

- .1 Respect safety measures described in the manufacturer's written directives, as well as RCABC written recommendations.
- .2 At the end of each work day, use an infrared detector to spot any smouldering or concealed fire. Job planning must be organized to ensure workers are still on location at least one hour after torch application.
- .3 Never apply the torch directly to dry wood surfaces. Comply with the fire safety recommendations of the manufacturer and the RCABC.
- .4 Throughout roofing installation, maintain a clean site and have one approved ABC fire extinguisher within 6 meters of each roofing torch. Respect all safety measures described in technical data sheets. Torches must never be placed near combustible or flammable products.

#### **1.10 Waste Management and Disposal**

- .1 Separate waste materials for reuse and recycling in accordance with Section 01 74 21 – Waste Management and Disposal.
- .2 Remove from site and dispose of packaging materials at appropriate recycling facilities.
- .3 Collect and separate for disposal paper, plastic, polystyrene, corrugated cardboard, packaging material in appropriate on-site bins for recycling in accordance with Waste Management Plan.
- .4 Separate for reuse and recycling and place in designated containers in accordance with Waste Management Plan.
- .5 Place materials defined as hazardous or toxic in designated containers.
- .6 Handle and dispose of hazardous materials in accordance with Laws and regulations.
- .7 Clearly label location of salvaged material's storage areas and provide barriers and security devices.
- .8 Ensure emptied containers are sealed and stored safely.
- .9 Divert unused materials from landfill to recycling facility as approved by Owner's Representative.
- .10 Unused adhesives, sealant, and asphalt materials must not be disposed on into sewer

system, into streams, lakes, onto ground or in other location where it will pose health or environmental hazard.

- .11 Dispose of unused adhesive material at official hazardous material collections site approved by Owner's Representative.

#### **1.11 Co-Operation with Other Trades**

- .1 Advise all other trades of their responsibility in having pipes, sleeves, A/C unit fan, and cowl bases installed on the roof in adequate time so that the roofing work is not delayed. Coordinate roofing with mechanical and electrical trades.
- .2 The mechanical trades shall be responsible for cap and counterflashing of any ducts, vents, stacks, or other sheet metal projecting through the roof. This section shall provide base flashing over wood or metal curbs, etc., and seal lead flashings for service lines into the roof members.

#### **1.12 Job Conditions**

- .1 Conform to the ambient air temperature and humidity requirements and limitations as set forth by the membrane system manufacturer, the RCABC and the Roofing Inspection Agency for installation of all systems and materials.
- .2 Minimum installation air temperature for solvent-based adhesives and compounds is (-) 5 degree C.
- .3 Protect roof decks from damage due to roofing or sheet metal operations. Protect work of other trades from damage; replace and/or make good any and all such damages caused by work of this section.
- .4 Protect all adjacent surfaces and work during roofing from damage, with special protection adjacent to hoist.
- .5 Inspect surfaces to receive work of this section and report any defects in writing to the Consultant.
- .6 Commencement of work will imply acceptance an approval of such surfaces and no claim for defects in workmanship will subsequently be allowed.
- .7 Provide all temporary tarps and structures, at no additional cost to the Owner's Representative, required to protect building and roofing from weather conditions, which may cause a delay in meeting project schedules.

#### **1.13 Inspection & Warranty**

- .1 The Contractor shall, at no additional cost to the Owner's Representative, arrange for the supplier/manufacturer of the membrane system, to inspect the work in progress after base sheet installation and during seaming, and upon completion, to ensure that the complete system is installed in full compliance with the supplier's/manufacturer's specifications, recommendations, and details. Manufacturer's representative is to provide a copy of the site inspection report after each site visit.
- .2 For Work of this section, the 12 months warranty period is supplemented by a RCABC 10-year Installation Guarantee for membrane systems at the completion of the Work. Roof inspection shall be performed by an independent inspection agency appointed by the Owner's Representative. Costs for inspections and warranty shall be paid for by the Contractor. Inspection service shall include additional inspection of roof immediately prior to an interim completion of this Contract.
- .3 The Contractor shall co-operate with the appointed inspection agency; provide material samples when requested and provide access to the work in progress.



- .4 The Contractor shall obtain from the manufacturer of the elastomeric bitumen membrane system, a written warranty stating that its products are free of manufacturing defects and shall provide a waterproof surface for 20 years after installation. If infiltration happens due to faulty material, the manufacturer shall make the necessary repairs, at its expense.

#### **1.14 Environmental Requirements**

- .1 Install roof/deck 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 +1°C for torch, or an equivalent temperature allowing for windchill 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 reinstall 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.

### **PART 2 PRODUCTS**

#### **2.1 Component Compatibility**

- .1 Ensure that all components of the membrane systems are compatible. All membrane, accessories and associated mastic/sealant compounds shall be products of the same manufacturer.

#### **2.2 Sheathing Board**

##### DensDeck Prime

- .1 18 mm thick thermal barrier steel deck sheathing board. Board shall be mechanically fastened to steel decking. Supply complete with manufacturer's standard fixings and plates ("Soprafix" system).
- .2 In addition to providing a flat surface to steel decking, the board shall act as a thermal barrier to protect roof components from fire within the building while also providing protection as a vapour barrier.

#### **2.3 Vapour Barrier**

- .1 Sopraflash Stick HR 40.

#### 2.4 Roof Insulation (Base/Intermediate Layers)

- .1 High strength moulded closed cell polyisocyanurate foam core integrally laminated to heavy, black, non-asphaltic fibre reinforced glass facers, adhered to substrate.
- .2 Insulation shall conform to CAN/ULC-S704-2001 Const No. C34 and CAN/ULC-S770-2000 for determination of long term thermal resistance of closed cell insulating forms and shall meet or exceed the physical property values from the following table:

PROPERTY	TEST METHOD	VALUES
Dimensional Stability (Length and Width)	ASTM D2126	<2%
Compressive Strength (10% Deformation)	ASTM D1621	140 kPa
Water Absorption	ASTM C209 ASTM D2842	<1% <3.5%
Moisture Vapour Transmission	ASTM E96	<1.5 perm (85.0 ng/(Pa•s•m <sup>2</sup> ))
Product Density	ASTM D1622	Nominal 32.04 kg/m <sup>3</sup>
Flame Spread	ASTM E84 (Full 10 min. Test)	25-50**
Smoke Developed	ASTM E84 (Full 10 min. Test)	50-170**
Tensile Strength	ASTM D1623	>35 kPa
Service Temperature	-	-73 to 122°C

- .3 Insulation shall be engineered factory-tapered to create crickets, back slopes and where indicated. Insulation thicknesses: 50 mm base layer, 75 mm intermediate layer.
- .4 Acceptable product: Soprema Sopra-Iso Plus, or similar.

#### 2.4 Mineral Fibre Insulation Protection Layer

- .1 Mineral wool board, made from basalt rock and slag, with bitumen-impregnated rigid upper face compatible with roofing membranes and resistant to torch application of base roofing ply.
- .2 Applied as top layer (102 mm thick) over base and intermediate layers of polyisocyanurate insulation as protection from "insulation creep" and complying with following Table of Properties:

Property	Test Method	Values
Thermal Resistance (RSI Value – m <sup>2</sup> K/W for 25.4 mm at 75°F)	ASTM C518 (C177)	0.68 m <sup>2</sup> K/W (R-3.8 hr ft <sup>2</sup> F / BTU for 1 in 75°F)
Compressive Strength - Top Layer at 10% - Top Layer at 25% - Entire Board (3 in Thickness) at 10%	ASTM C165	139 kPa (20.2 psi) 252 kPa (37.0 psi) 71 kPa (10.3 psi) 103.5 kPa (150 psi)

- Entire Board (3 in Thickness) at 25% - Point load at 5 mm compression	EN 12430	205 kPa (30.0 psi)
Density - Top Layer - Bottom Layer * Formed as a monolithic structure	ASTM C612-09	13.75 lb/ft <sup>3</sup> (22 kg/m <sup>3</sup> ) 10.0 lb/ft <sup>3</sup> (160 kg/m <sup>3</sup> )
Dimensional Stability, Linear Shrinkage 24 hours at 1200°F (650°C)	ASTM C356	0.71%
Water Absorption	ASTM C209	<1.0%
Water Vapor Sorption	ASTM C1104	0.15%

.3 Accepted products:

- .1 "Soprarock DD Plus" by Soprema.
- .2 "Toprock DD Plus" by Roxul.
- .3 Other products with the same demonstratable characteristics will not be excluded.

**2.5 Adhesive**

- .1 Adhesive for securing roof insulation: two-part polyurethane foamed adhesive as acceptable to manufacturers of all components to be bonded and to RCABC.
- .2 An example of the product is "Duo Tack" by Soprema Waterproofing. Other products having the same characteristics will not be excluded.

**2.6 Membranes**

- .1 All membranes must meet or exceed ASTM D6162, CSA A123.21-10, FM4470, CAN/CGSB 37.56 M, ULC-S107.
- .2 Base Sheet (and Base Stripping Ply at Non-Combustible Substrates):
  - .1 Membrane shall be composed of a composite reinforcement and SBS modified bitumen, 2.5 mm thick, with both faces covered with a thermofusible plastic film. This membrane shall be torch-applied.
  - .2 Reinforcement: composite.
  - .3 Elastomeric asphalt: mix of selected bitumen and minimum 12% SBS thermoplastic polymer.
  - .4 Physical properties: (as per CAN/CGSB-37.56-M, 9<sup>th</sup> Draft)

<b>Properties</b>	<b>MD</b>	<b>XD</b>
.1 Strain energy	7.8 kN/m	7.2 kN/m
.2 Breaking strength	15 kN/m	13.5 kN/m
.3 Ultimate elongation	60%	65%
.4 Tear resistance	125 N	
.5 Static puncture resistance	560 N	
.6 Dimensional stability	0.2%	0%
.7 Plastic flow	≥110°C (230°F)	
.8 Cold bending at -30°C (-22°F)	No cracking	
.9 Lap joint strength	Pass > 4 kN/m	

.5 An example of the accepted product is “Sopraply Base 520” by Soprema Waterproofing. Other products having the same characteristics will not be excluded.

.3 Self-Adhesive Membrane:

(Base Stripping Ply at Combustible Substrates and Where Required)

.1 Membrane shall be self-adhesive SBS modified bitumen, with composite reinforcement, covered with a thermofusible plastic film. Membrane shall be available in both summer and winter grades. Thickness: 3.0 mm.

.2 Physical properties: (as per CAN/CGSB-37.56-M, 9<sup>th</sup> Draft)

.1	Strain energy, MD/XD (kN/m)	7.8 / 7.2
.2	Breaking strength, MD/XD (kN/m)	15 / 13.5
.3	Ultimate elongation, MD/XD (%)	60 / 65
.4	Tear resistance (N)	125
.5	Static puncture (N)	560
.6	Cold bending (C) - Initial	-30
	- 90 days at 70°C	-30

.3 An example of the product is “Sopralene Flam Stick” by Soprema Waterproofing. Other products having the same characteristics will not be excluded.

.4 Cap Sheet:

.1 3.7 mm thick Styrene Butadiene Styrene (SBS) high performance membrane shall have a composite reinforcement and thermofusible elastomeric asphalt. Under side shall be protected by a thermofusible plastic film. This membrane shall be applied by torching only. Top surface of membrane shall be covered with highly reflective white granules. Membrane shall be factory-treated with fire retardant.

.2 Membrane shall have a minimum SRI of 86 regarding heat island.

.3 Physical Properties: (as per CAN/CGSB-37.56-M, 9<sup>th</sup> Draft).

	<b>Properties</b>	<b>MD</b>	<b>XD</b>
.1	Strain energy	11.9 kN/m	9.5 kN/m
.2	Breaking strength	19.5 kN/m	15.1 kN/m
.3	Ultimate elongation	61%	75%
.4	Tear resistance		70 N
.5	Static puncture resistance		470 N
.6	Dimensional stability	-0.2%	0.1%
.7	Plastic flow		≥110°C (230°F)
.8	Cold bending at -30°C (-22°F)		No cracking
.9	Lap joint strength		Pass > 4 kN/m
.10	SRI (ASTM E1980)		86

.4 An example of the accepted product is “Supraply Traffuc Cap 560” by Soprema Waterproofing. Other products having the same characteristics will not be excluded.

.5 Cap Stripping Ply and Traffic Walkway

.1 4.0 mm thick Styrene Butadiene Styrene (SBS) high performance membrane shall have a composite reinforcement and thermofusible elastomeric asphalt.

Under side shall be protected by a thermofusible plastic film. This membrane shall be applied by torching only. Top surface of membrane shall be covered with highly reflective white granules. (Contrasting colour where membrane is employed as traffic walkway). Membrane shall be factory-treated with fire retardant.

.2 Physical Properties: (as per CAN/CGSB37.56-M, 9<sup>th</sup> DRAFT)

	<b>Properties</b>	<b>MD</b>	<b>XD</b>
.1	Strain energy	7.8 kN/m	7.2 kN/m
.2	Breaking strength	15 kN/m	13.5 kN/m
.3	Ultimate elongation	60%	65%
.4	Tear resistance	125 N	
.5	Static puncture resistance	560 N	
.6	Dimensional stability	0.2%	0%
.7	Plastic flow	≥110°C (230°F)	
.8	Cold bending at -30°C (-22°F)	No cracking	
.9	Lap joint strength	Pass > 4 kN/m	

.3 An example of the accepted product is “Sopraply Traffic Cap FR 561” by Soprema Waterproofing. Other products having the same characteristics will not be excluded.

**2.7 Protection Board**

.1 2 layers of 6mm Sopraboard, staggered joints.

**2.8 Acceptable Membrane System Manufacturers**

- .1 Soprema.
- .2 Siplast.

**2.9 Catalyzed Resin Liquid Flashing System**

.1 Multi-component, fully reinforced, flexible polymethyl methacrylate-based (PMMA) liquid flashing membrane system by same manufacturer as roofing membranes and complying with the following Table of Properties.

<b>Property</b>	<b>Test Method</b>	<b>Values</b>
Membrane thickness	ASTM D5147 Sec 5	2.9 mm (115 mils)
Peak load @ 23°C (73°F) avg.	ASTM D5147 Sec 6	12.3 kN/m (70 lbf/in)
Elongation @ peak load, avg.	ASTM D5147 Sec 6	42%
Peak load @ 23°C (73°F) avg.	ASTM D412 (dumbbell)	15.8 kN/m (90 lbf/in)
Elongation @ peak load, avg.	ASTM D412 (dumbbell)	55%
Shore A hardness, avg.	ASTM D2240	81
Water absorption, (Method I) (24h @ 23°C (73°F))	ASTM D570	0.41%
Water absorption, (Method II) (48h @ 50°C (122°F))	ASTM D570	1.57%
Low temperature flexibility	ASTM D5147 Sec 11	-25°C (-13°F)
Dimensional stability (max. movement)	ASTM D5147 Sec 10	-0.063%

Tear strength	ASTM D5147 Sec 7	0.5 kN (107 lbf)
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- .2 Liquid flashing shall be available in “summer” and “winter” grades, be supplied with companion primer for non-metallic substrates, catalyst and fleece reinforcement. Employ where noted and required.
- .3 An example of the accepted product is “Alsan RS230 System” by Soprema or equal product produced by Siplast.

**2.9 Sealants**

- .1 As approved by membrane system manufacturer and by RCABC as being compatible with membrane system.
- .2 Plastic cement: asphalt, to CAN/CGSB-37.5 coal tar, to CGSB 37-GP-19M.
- .3 Sealing compound: to CAN/CGSB-37.29, rubber asphalt type.
- .4 Refer to section 07 90 00 – Sealants.

**2.10 Traffic Walkways & Roof Edge danger Zone Marking**

- .1 Where shown on drawings as walkways, and surface protection: additional ply of granular-faced cap stripping ply, material in contrasting colour to cap membrane, torch-applied over cap sheet. Minimum 900 mm wide. (Use membrane roll width).
- .2 Where shown on the drawings: delineate a 3048mm wide danger zone around roof perimeter by employment of a contrasting colour cap sheet membrane.

**2.11 Fasteners and Accessories**

- .1 Fasteners for mechanically fastening fire barrier sheathing board to steel roof deck shall be wind uplift and corrosion-resistant type as recommended and acceptable to the board manufacturer and to RCABC.
- .2 Fire Protection Tape: Fire retardant treated, 165 mm wide tape, composed of glass fleece reinforcement and SBS bitumen. The top side is sanded and the bottom side is covered with a silicone release film.
- .3 Splash Blocks: for use where scuppers from elevated roofs spill onto main roof. 600 x 600 x 50 mm stock pre-cast lightweight concrete patio pavers.

**2.12 Roof Drains & Overflow Scuppers**

- .1 Drains: Clamp-Tite spun copper drain by Menzies Metals
- .2 Scuppers: Clamp-Tite copper box scupper by Menzies Metals

**PART 3 EXECUTION**

**3.1 Workmanship - General**

- .1 All workmanship shall be at least in accordance with RCABC standards for a 10 year guarantee for the various systems described.
- .2 Use materials and systems in accordance with manufacturer’s specifications and instructions.
- .3 Leave no work exposed during unsettled weather. Glaze and finish membranes at end of each work period, to direction of roofing inspector.
- .4 Work to; and around all features, voids and edges, in best trade manner to produce watertight and weatherproof insulation.
- .5 Follow approved stripping and membrane flashing methods at eaves, curb, parapets, etc., in accordance with RCABC system guidelines.

- .6 All seams of granular surfaced cap membranes and wall covering shall be carefully heat welded with propane torch. Max. 3/16" bleed-out of bitumens will be accepted. Bleed-out at joints shall be covered with granular material to match cap sheets. Surfaces when completed shall present a neat, even appearance.
- .7 Apply only as much insulation to the roof as can be covered the same day with roofing membrane. At the conclusion of each day's work, seal exposed edges of the roof insulation. This seal shall be cut and lifted upon continuation of the work.
- .8 Do priming for modified asphalt roofing in accordance with CGSB 37-GO-15M.

### **3.2 Examination of Roof Decks**

- .1 Before commencing roofing work, this section, together with the Consultant and the Contractor, shall inspect all surfaces scheduled to receive membranes for condition, slopes, nailing supports, sheetmetal parapet facing, roof drains, stack vents, mechanical and electrical penetrations, building joints, etc.
- .2 All surfaces must be smooth, dry, clean and free of ice and debris. No salt or calcum shall be used to remove snow or ice.
- .3 Surfaces scheduled to receive membranes must possess a smooth surface with an even finish; free of excessive moisture, ridges, hollows and sharp corners.
- .4 If defects are found, a non-compliance notice will be issued to the Contractor so that adjustments can be made. Proposals for correction of defects shall be submitted to the Consultant for approval.
- .5 Corrections of defects shall be made at no additional cost to the Owner's Representative using materials which adhere to the substrate, are stable, do not deform under traffic loads and are compatible with bituminous materials. The deck must be clean, dry, and free of contamination by treatment products, lubricating oils, diesel oil or grease, which could affect the adhesion of the waterproofing or the physical integrity of the membrane itself.
- .6 Commencement of roofing/waterproofing work shall imply acceptance of surfaces and conditions.

### **3.3 Preparation**

- .1 Supply to the various sections concerned in ample time: all inserts, reglets, and accessories required to be built into the work of other sections. Instruct as to the proper location and position of such items.
- .2 Co-operate with, and coordinate work with Mechanical trades and other providers of interfacing materials and systems to ensure watertight junctions at roof drains, vents, and other items passing through the roof.
- .3 Minimize exposure of the roof deck to the elements by proceeding as soon as the roof deck is completed. Do not work during rain, fog, sleet, ice, or snow. Warm roofing materials before using in cold weather.
- .4 Sweep clean and remove all debris from roof deck surfaces before commencement of work.

### **3.4 Equipment**

- .1 Maintain all equipment and tools in good working order.
- .2 Use torch types recommended by the manufacturer of the elastomeric asphalt membranes, and acceptable to RCABC and ULC.

### **3.5 Roofing System Descriptions**

- .1 Roof Assembly Type 'R-1' (Class A-Insulated):
  - .1 Fire barrier sheathing board, per 2.2
  - .2 Vapour barrier, per 2.3
  - .3 Two layers (50 and 75 mm) polyiso roof insulation adhesive-applied, factory-tapered at crickets and back-slopes.
  - .4 One-layer 75 mm mineral fibre insulation/protection, adhesive-applied with joints staggered from those of previous layer.
  - .5 Protection Board, per 2.7
  - .6 Base sheet torch-applied.
  - .7 Granular cap sheet torch-applied.
  - .8 Stripping and membrane flashing, granular-surfaced where exposed to view.
  - .9 Traffic deck, torch-applied.
  - .10 All Parapets and Vergers:
    - .1 Prepare and prime sheetmetal parapet facing.
    - .2 Torch-applied base stripping ply full height
    - .3 Granular cap sheet torch-applied

### **3.6 Primer Application**

- .1 Apply all primers in accordance with the manufacturer's directions to all surfaces prior to application of membranes and other roofing components.

### **3.7 Fire Retardant Tape Application (where required)**

- .1 Prior to the application of any torch on base sheet materials, install a width of tape over substrate cracks, voids in the construction, angle changes at curbs, parapets, penetrations, walls, and penetrations to prevent contact of flame with combustible materials or construction debris.

### **3.8 Insulation Installation**

- .1 Insulation: adhesive application.
  - .1 Apply insulation in following order: 50 mm polyisocyanurate base layer, 75 mm polyisocyanurate intermediate layer and 75 mm mineral fiber top layer.
  - .2 Adhere insulation to substrate and preceding layers using adhesive applied in accordance with manufacturer's instructions, in adhesive ribbons with minimum 150mm spacing.
  - .3 Place boards in parallel rows with ends staggered, and in firm contact with one another.
  - .4 Cut end boards to suit.

### **3.10 Membrane Application**

- .1 Base sheet application:
  - .1 Starting at low point of roof, perpendicular to slope, unroll base sheet, align and reroll from both ends.
  - .2 Unroll and torch base sheet onto substrate taking care not to burn membrane or its reinforcement or substrate.
  - .3 Lap sheets 75 mm minimum for side and 150 mm minimum for end laps.
  - .4 Application shall be free of blisters, wrinkles and fishmouths.



- .2 Cap sheet application:
  - .1 Starting at low point on roof, perpendicular to slope, unroll cap sheet, align and reroll from both ends.
  - .2 Unroll and torch cap sheet onto base sheet taking care not to burn membrane or its reinforcement.
  - .3 Lap sheets 75 mm minimum for side laps and 150 mm minimum for end laps. Offset joints in cap sheet 300 mm minimum from those in base sheet.
  - .4 Application shall be free of blisters, fishmouths and wrinkles.
- .3 Membrane Flashing (Stripping Plies) Application:
  - .1 Complete installation of flashing base sheet stripping prior to installing membrane cap sheet.
  - .2 Apply base and cap sheet onto substrate in 1 meter wide strips.
  - .3 Lap flashing base sheet to membrane base sheet minimum 150 mm and seal.
  - .4 Lap flashing cap sheet to membrane cap sheet 250 mm minimum and torch weld.
  - .5 Provide 75 mm minimum side lap and seal.
  - .6 Torch-weld cap stripping ply and base stripping at non-combustible substrates. Self-adhesive-apply base stripping to combustible substrates.

### **3.11 Traffic Walkway Installation**

- .1 Install walkway strips, in contrasting colour (as selected by Consultant) to cap sheet substrate, in accordance with manufacturer's written instructions, to areas as shown on drawings.

### **3.12 Interim Completion Inspection**

- .1 Inspect the roofs at or just before the date of substantial completion. Remove all nails and other debris which will cause damage to roof membranes. Ensure the roof has not been damaged by construction activities and the interfacing with the existing roof membrane system is complete and free of any defects. Leave the entire roof ready for final inspection by Inspection Company.
- .2 Provide the Consultant with a written certificate that this inspection has been completed.

### **3.13 Adjust and Clean**

- .1 Repair, remove and clean all drips or smears of adhesive and asphalt on exposed finished surfaces or surface to be subsequently finished. Clean off immediately as directed by Consultant.
- .2 As the work progresses and at completion of the work, clean up and remove from the site, all rubbish and debris resulting from roofing and sheet metal work.

END OF SECTION



**Part 1 GENERAL**

**1.1 Related Sections**

1. Section 01 45 00 Quality Control
2. Section 07 27 13 Self-Adhesive Membrane
3. Section 07 42 43 Composite Wall Panel System
4. Section 07 52 00 Modified Bituminous Membrane Roofing
5. Section 07 90 00 Sealants
6. Division 8 Flashing Associated with Fenestration

**1.2 References**

1. American Society for Testing and Materials (ASTM International).
  - .1 ASTM A653/A653M03, Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.
2. Roofing Practices Manual as published by the Roofing Contractors Association of British Columbia.
3. Sheet Metal and Air Conditioning Contractor's National Association, Inc., "Architectural Sheet Metal Manual" (SMACNA).

**1.3 Submittals**

1. All submittals shall be in accordance with Section 01 33 00 – Submittal Procedures.
2. Samples:
  - .1 Submit 100 x 150 mm samples of each type of sheet metal material, colour and finish.

**Part 2 PRODUCTS**

**2.1 Exposed Cap Flashing (Parapets & Guardwalls)**

1. Provide zinc cap flashing under provisions of Section 07 42 00 Metal Wall Panels.

**2.2 Sheet Flashing Materials**

1. Zinc coated steel sheet: Commercial quality to ASTM A653/A653M, with Z275 designation zinc coating, shop-spray-painted with a PPG Fluoropolymer coating (refer to Section 09 90 00 – Painting and Coating). Colour as selected by Consultant to match interfacing wall panels.

- .1 Metal thickness shall be minimum 24 gauge, but adjusted to accommodate use and span in order to yield a smooth, non oil-canned surface.
2. Aluminum sheet: proprietary minimum 22 gauge utility sheet, plain pattern, to CAN/CGSB 93.1 clear anodized to match aluminum composite wall panels and glazing systems where associated with those systems.

### **2.3 Accessories**

1. Isolation coating: alkali resistant bituminous paint.
2. Plastic cement: to CAN/CGSB 37.5.
3. Self-adhered Membrane: as per Section 07 27 13.
4. Sealants: In accordance with Section 07 90 00.
5. Cleats: of same material, and temper as sheet metal, minimum 50 mm wide. Thickness same as sheet metal being secured.
6. Fasteners: of same material as sheet metal, to CSA B111, flat head roofing nails of length and thickness suitable for metal flashing application.
7. Washers: of same material as sheet metal, 1 mm thick with rubber packings.
8. Touch-up paint: as recommended by prefinished material manufacturer.

### **2.4 Fabrication**

1. Fabricate metal flashings and other sheet metal work in accordance with applicable RCABC details, SMACNA details and as indicated.
2. Form pieces in 2438 mm maximum lengths. Make allowance for expansion at joints.
3. Hem exposed edges on underside 13 mm. Mitre and seal corners with sealant.
4. Form sections square, true and accurate to size, free from distortion and other defects detrimental to appearance or performance.
5. Apply isolation coating to metal surfaces to be embedded in concrete or mortar.

### **2.5 Metal Flashings and Formed Sheet Metal**

1. Form flashings, copings, cap flashings and fascias to profiles indicated from minimum 24 gauge material. (22 gauge for aluminum).
2. Form reglets, gum pockets, clamping bars and other members shown on drawings from zinc alloy of sufficient thickness to safely produce a weather tight seal with workmanlike appearance.

3. For roof edge metal upstands ("Sheet Metal Parapet") or other descriptions noted on drawings from minimum 1.22 mm thick galvanized steel or as otherwise noted thickness on drawings.

## **2.6 Fasteners**

- .1 Steel pan head screws with fine thread for metal. Can be self tapping or self drilling.
- .2 #8 x 1/2" (minimum) long stainless steel suitable for metal flashing application. Stainless to be 300 Series when exposed- otherwise 300 or 400 Series is acceptable.
- .3 For exposed conditions use pan head stainless steel screws, with neoprene washer, heads coloured to match flashing.

## **2.7 Overflow Scuppers**

1. Form scuppers from min. 22 gauge thick material.
2. Sizes and profiles as indicated and as per requirements of RCABC and SMACNA.
3. Provide necessary fastenings.

## **Part 3 EXECUTION**

### **3.1 Installation**

1. Install sheet metal work in accordance with RCABC details, SMACNA details and as indicated.
2. Use concealed fastenings except where approved before installation.
3. Counterflash bituminous flashings at intersections of roof with vertical surfaces and curbs. Flash joints using S-lock seams forming tight fit over hook strips, as detailed.
4. Use standing seams at corners.
5. Lock end joints and caulk with sealant.
6. Install surface mounted reglets true and level, and caulk top of reglet with sealant.
7. Insert metal flashing into reglets and under cap flashings to form weather tight junction.
8. Turn top edge of flashing into recessed reglet or mortar joint minimum of 1". Lead wedge flashing securely into joint.
9. Caulk flashing at reglet and cap flashing with sealant.
10. Install head & sill flashings at windows & doors in one continuous piece whenever possible.
11. Install flashings lapped "shingle" style with membranes to divert water to the exterior.
12. Install all flashings so that all surfaces have a minimum slope of 1:4 to the exterior.
13. Extend flashing min. 13mm past all cladding, complete with a drip-edge.

**3.2 Installation of Scuppers**

1. Install scuppers as indicated and to requirements of RCABC and SMACNA.

**END OF SECTION**

## **PART 1 GENERAL**

### **1.1 Related Work**

- .1 Section 07 52 00 Modified Bituminous Membrane Roofing
- .2 Section 07 62 00 Sheet Metal Flashing and Trim
- .3 Section 09 90 00 Painting and Coating

### **1.2 Shop Drawings**

- .1 Submit shop drawings in accordance with Section 01 33 00.
- .2 Indicate size and description of components, materials, attachment devices, description of frame and finish, and construction details.

## **PART 2 PRODUCTS**

### **1.1 2.1 Materials**

- .1 Aluminum sheet: mill finish plain pattern utility sheet.
- .2 Aluminum: extruded sections of AA6063-T5 alloy, all components one piece without splices.
- .3 Gaskets: extruded resilient neoprene, with full recovery after 50% compression.
- .4 Insulation: fibrous glass, to CSA A101, Type IA with thermal resistance value of RSI.87.
- .5 Fasteners: adequately secure curb to roof deck.
- .6 Sealants: in accordance with Section 07 90 00, clear colour selected by Departmental Representative.
- .7 Isolation coating: alkali resistant bituminous paint or epoxy solution.

### **2.2 Components**

- .1 Hatch lid, single lead:
  - .1 914 X 762mm inside cover dimension by 25mm thick.
  - .2 Cover of 3mm sheet aluminum with 75mm beaded flange at perimeter.
  - .3 Liner of 0.8 sheet aluminum.
  - .4 Resilient gasket/seal to inner face of lid in contact with hatch lid support frame.
- .2 Hatch lid support frame: 3mm sheet aluminum.
- .3 Curb:
  - .1 Frame 305mm high, of 3mm sheet aluminum with 89mm flange for support to deck and integral cap flashings.
  - .2 Outer surface cladding: 1mm sheet aluminum outer liner.
- .4 Screws: to CSA B35.2.1963 (R1969) stainless steel for curb to structure.
- .5 Hinges: type recommended by roof hatch manufacturer.
- .6 Latch: positive snap with turn handles inside and out and padlock hasps inside and outside.
- .7 Securing latch: hold open operating arm with vinyl grip handle to permit one handed release.
- .8 Feature to prevent from being locked on roof.

**2.3 Fabrication**

- .1 Fabricate components free of twists, bends or visual distortion and properly insulated. Weld corners and joints.
- .2 Assemble roof hatch components as indicated.
- .3 Ensure continuity of weather-tight seal.
- .4 Design flashings to collect and lead off condensation accumulated.

**PART 3 EXECUTION**

**3.1 Installation**

- .1 Install roof hatches plumb, level and in proper alignment as indicated.
- .2 Adjust and seal assembly with provision for expansion and contraction of components.
- .3 Secure prefabricated curb assembly to structure where indicated.
- .4 Coat aluminum in contact with dissimilar materials, with isolation coating.
- .5 Ensure integral installation with roof membrane.

END OF SECTION



## **PART 1 GENERAL**

### **1.1 Summary**

- .1 This section specifies standards for caulking and sealants applied by this and other sections.
- .2 Refer to other sections for additional caulking and sealants.

### **1.2 Reference Standards**

- .1 CAN/CGSB-19.13-M87 Sealing Compound, One-component, Elastomeric, Chemical Curing.
- .2 CGSB 19-GP-14M-76 Sealing Compound, One Component, Butyl-polyisobutylene Polymer Base, Solvent curing.
- .3 CAN/CGSB-19.17-M90 One-Component Acrylic Emulsion Base Sealing Compound.
- .4 CAN/CGSB-19.21-M87 Sealing and Bedding Compound Acoustical.
- .5 CAN/CGSB-19.22-M90 Mildew Resistant, Sealing Compound for Tubs and Tiles.
- .6 CAN/CGSB-19.24-M90 Multi-component, Chemical Curing Sealing Compound.

### **1.3 Environmental and Safety Requirements**

- .1 Comply with requirements of Workplace Hazardous Materials Information System (WHMIS) regarding use, handling, storage, and disposal of hazardous materials; and regarding labeling and provision of material safety data sheets acceptable to Labour Canada.
- .2 Comply with requirements specified in the following sections:
  - .1 Section 01 35 43 – Environmental Procedures
  - .2 Section 01 74 21 – Waste Management and Disposal
- .3 Conform to manufacturer's recommended temperatures, relative humidity, and substrate moisture content for application and curing of sealants including special conditions governing use.
- .4 Sealant and substrate materials to be minimum 5° C.
- .5 Should it become necessary to apply sealants below 5° C, consult sealant manufacturer and follow their recommendations.

### **1.4 Waste Management and Disposal**

Separate waste materials for reuse and recycling in accordance with Section 01 74 21 Waste Management and Disposal.

## **PART 2 PRODUCTS**

### **2.1 Sealant Materials**

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

### **2.2 Sealant Material Designations**

- .1 Urethanes One Part.
  - .1 Self-Levelling to CAN/CGSB-19.13, Type 1, colour as selected.
  - .2 Non-Sag to CAN/CGSB-19.13, Type 2, MCG-2-40, colour as selected.
  - .3 Acceptable materials:
    - .1 Tremco Dymonic 100.
    - .2 Tremco Dymonic FC.
    - .3 BASF Masterseal NP1.
- .2 Silicones One Part.
  - .1 Single component neutral cure silicone to CAN/CGSB 19.13.
  - .2 Acceptable materials :
    - .1 Dow Corning 795 (where both sides consist of nonporous surfaces)
    - .2 Dow Corning 790 Low modulus (where both sides consist of cementitious substrates)
- .3 Air Barrier Sealant (for poor bonding surfaces). To adhere to spun bonded polyolefin and fibrous or woven air barrier sheet material and poly faced self adhered membranes.
  - .1 Acceptable material: Dow Corning 758
- .4 Acoustical Sealant
  - .1 To CAN/CGSB-19.21
- .5 Butyl Sealant
  - .1 Noncuring, flexible polyisobutylene sealant.
  - .2 Acceptable products: Tremco Butyl sealant.
- .6 Acrylic Latex One Part.
  - .1 To CGSB 19-17.
- .7 Preformed Compressible and Non-Compressible back-up materials.
  - .1 Polyethylene, Urethane, Neoprene or Vinyl Foam.
    - .1 Extruded closed cell foam backer rod.
    - .2 Size: oversize 40 to 50%.
  - .2 Neoprene or Butyl Rubber
    - .1 Round solid of Shore A hardness 70.
  - .3 High Density Foam.

- .1 Extruded closed cell polyvinyl chloride (PVC), extruded polyethylene, closed cell, Shore A hardness 20, tensile strength 140 to 200 kPa, extruded polyolefin foam, 32 kg/m<sup>3</sup> density, or neoprene foam backer, size as recommended by manufacturer.
- .4 Bond Breaker Tape.
  - .1 Polyethylene bond breaker tape, which will not bond to sealant.

### **2.3 Sealant Selection**

- .1 Perimeters of exterior openings where frames meet exterior façade of building: Sealant type: one component Silicone, non-sag.
- .2 Coping joints and coping-to-façade joints & flashing joints: Sealant type: butyl.
- .3 Interior control and expansion joints in floor surfaces: Sealant type: one component urethane self-levelling.
- .4 Countertops (e.g. sinks, urinals, basins, vanities): Sealant type: silicone, mildew resistant.
- .5 Exposed interior control joints in drywall: Sealant type: acrylic latex.
- .6 Concealed joints in sound attenuated walls and ceilings: Sealant type: acoustic.
- .7 Colour of sealants: selected by Consultant from manufacturer's standard range to match adjacent surfaces.
- .8 Joint cleaner: xylol, methylethyleketon or non-corrosive type recommended by sealant manufacturer and compatible with joint forming materials.

### **2.4 Joint Cleaner**

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

## **PART 3 EXECUTION**

### **3.1 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 dust, rust, oil, grease, and other matter which may impair work.
- .3 Do not apply sealants to joint surfaces treated with sealer, curing compound, water repellent, or other coatings unless tests have been performed to ensure compatibility in materials. Remove coatings as required.
- .4 Ensure joint surfaces are dry and frost free.
- .5 Prepare surfaces in accordance with manufacturer's directions.

### **3.2 Priming**

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

### **3.3 Back Up Material**

Apply bond breaker tape where required to manufacturer's instructions.

Install joint filler to achieve correct joint depth and shape, with approximately 30% compression.

### **3.4 Mixing**

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

### **3.5 Application**

- .1 Sealant.
  - .1 Apply sealant in accordance with manufacturer's written instruction.
  - .2 Mask edges of joint where irregular surface or sensitive joint border exists to provide neat joint.
- .2 Apply sealant in continuous beads.
- .3 Apply sealant using gun with proper size nozzle.
- .4 Use sufficient pressure to fill voids and joints solid.
- .5 Form surface of sealant with full bead, smooth, free from ridges, wrinkles, sags, air pockets, embedded impurities.
- .6 Tool exposed surfaces before skinning begins to give slightly concave shape.
- .7 Remove excess compound promptly as work progresses and upon completion.
- .8 Curing.
  - .1 Cure sealants in accordance with sealant manufacturer's instructions.
  - .2 Do not cover up sealants until proper curing has taken place.
- .9 Cleanup.
  - .1 Clean adjacent surfaces immediately and leave work neat and clean.
  - .2 Remove excess and droppings, using recommended cleaners as work progresses,
  - .3 Remove masking tape after initial set of sealant.

END OF SECTION

## **PART 1 GENERAL**

### **1.1 Section Includes**

- .1 Interior and exterior hollow metal doors and frames.
- .2 Interior glazed hollow metal screens (borrowed lights).

### **1.2 Related Sections**

- .1 Section 06 10 00 Rough Carpentry
- .2 Section 06 20 00 Finish Carpentry
- .3 Section 07 21 00 Building Insulation
- .4 Section 08 80 00 Glazing
- .5 Section 09 22 00 Non-Structural Metal Framing
- .6 Section 09 90 00 Painting

### **1.3 References**

- .1 CSDFMA – Specification for Commercial Steel Doors and Frames Canadian Steel Door and Frame Manufacturers' Association 1990.
- .2 CAN4-S105-M85 - Standard Specification for Fire Door Frames Meeting the Performance Required by CAN4-S104.
- .3 CAN4-S106-M80 - Standard Method for Fire Tests of Window and Glass Block Assemblies.
- .4 NFPA No. 80-1999 - Fire Doors and Windows.
- .5 CAN4-S104M80 - Fire Tests of Door Assemblies.
- .6 Recommended Locations For Architectural Hardware as published by the Door and Hardware Institute.
- .7 Installation of Commercial Steel Doors and Frames as published by the Door and Hardware Institute (DHI).

### **1.4 Performance Requirements**

- .1 Fire door and frame assembly shall be constructed as tested to CAN4-S105M.

### **1.5 Submittals**

- .1 All submittals shall be in accordance with Section 01 33 00 – Submittal Procedures.
- .2 Shop Drawings:
  - .1 Clearly indicate each type of door and frame, material core thickness, mortises, reinforcements, anchorages, glazing, location of exposed fasteners and hardware arrangements.
  - .2 Include schedule identifying each unit, with door marks and numbers relating to numbering on drawings and in Door and Frame Schedule.
- .3 Acoustical Test Data:

- .1 If requested, submit acoustical test data for sound-rated doors from an independent test laboratory.

## **1.6 Quality Assurance**

- .1 Conform to the requirements of the CSDFMA standards.
- .2 Fire-rated doors shall conform to CAN4-S104M.
- .3 Fire-rated frame construction shall conform to CAN4-S105M.
- .4 Installed door and frame assembly shall conform to NFPA No. 80 for fire protection rating scheduled.

## **1.7 Regulatory Requirements**

- .1 Doors shall meet the temperature rise limits and glass area limits when installed in locations required by the 2015 National Building Code of Canada (NBCC).

## **1.8 Delivery, Storage and Handling**

- .1 Store doors and frames in an upright position, protected from the elements and raised above the ground in a manner to prevent corrosion damage.
- .2 Damaged, sprung or twisted doors or frames, or doors with interior cores or frames telegraphing through will be rejected.
- .3 Prepare a coding and identification system for delivery and installation of doors and frames.
- .4 Submit a copy of the coding system to the Consultant. Coordinate coding system with Finish Hardware Schedule and Door and Frame Schedule (on the Drawings).

# **PART 2 PRODUCTS**

## **2.1 Materials**

- .1 Sheet Steel: ASTM A924, galvanized to ASTM A653, Class ZF075, wiped zinc coated. The sheet to be free of scale, pitting, coil breaks, buckles, waves or other surface blemishes.
- .2 Insulation: Fiberglass, polystyrene or polyurethane for exterior nonrated doors; for rated doors, use core approved by labelling authority.
- .3 Core: Resin impregnated heavy kraft paper, expanded honeycomb, each cell approximately 25 mm across.
- .4 Accessories: Resilient door bumpers, rigid extruded PVC door top closures.
- .5 Glazing Stops: Rolled channel shape, butt corners, prepared for security head style screws.
- .6 Glazing: In accordance with Section 08 80 00.

## **2.2 Frames**

- .1 Frames: sizes as scheduled on Door and Frame Schedule on drawings.
- .2 All exterior H.M. door frames shall be thermally broken.

- .3 Fire-Rated Frames: Fabricate fire-rated frames in accordance with underwriter's requirements using material not less than the thickness specified herein unless a greater thickness is stipulated by the labelling authority.

### **2.3 Doors**

- .1 Face sheet thicknesses: 1.2 mm CRS.
- .2 Interior Doors: Face sheets pressure laminated to kraft paper core, mechanically interlocked and epoxy sealed vertical edges, top and bottom end channel closures spot welded.
- .3 Exterior Doors: Face sheets, longitudinal edges fully welded, filled and sanded flush, top and bottom end channel closures spot welded, RSI 1.9 min. insulation fill in all voids.
- .4 Fire-Rated Doors: Fabricate fire-rated doors in accordance with underwriter's requirements using material not less than the thickness specified herein unless a greater thickness is stipulated by the labelling authority.
- .5 STC Rating as per Door and Frame Schedule on drawings.
- .6 Glazing in accordance with Section 08 80 00 to configurations as shown on Door and Frame Schedule on drawings.

### **2.4 Fabrication - Frames**

- .1 Fabricate frames in accordance with CSDFMA standards and details shown on drawings.
- .2 Fabricate frames as welded unit, knock-down frames are not permitted.
- .3 Finished work shall be neat in appearance, square, and free of defects, warps and buckles. Pressed steel members shall be straight and of uniform profile throughout their lengths.
- .4 Jamb, header, mullion, and sill profiles shall be in accordance with the frame schedule and as shown on the reviewed shop drawings.
- .5 Corner joints shall have contact edges closed tight with faces mitred and stops either butted or mitred. Faces and soffits shall be continuously welded and the faces ground and finished smooth. The use of gussets or splice plates as a substitute for welding will not be acceptable.
- .6 Prepare frames for silencers. Provide three (3) single silencers for single doors [mullions of double doors] on strike side and two (2) single silencers on frame head at double doors without mullions.
- .7 Attach fire-rated label to each frame unit at hinge side.
- .8 Provide floor anchors, not less than 1.7 mm thick, with two holes for fasteners, fastened to the inside jambs with at least four spot welds
- .9 Provide frame anchors of a type suitable for wall construction.
- .10 Provide frames with temporary steel spreader for shipping and handling.
- .11 Protect strike and hinge reinforcements in grout filled frames in masonry walls using guard boxes welded to frames.
- .12 Reinforce head of frames wider than 1200 mm; reinforce exterior frame assemblies to resist wind loading.
- .13 Provide steel channel type glazing stops at all glazed H.M. frame assemblies.

- .14 Glazing in accordance with Section 08 80 00.
- .15 Employ manufacturer's standard thermal break configuration on all exterior H.M. frames.

## **2.5 Fabrication - Doors**

- .1 Fabricate doors in accordance with CSDFMA standards. All surfaces shall be smooth and flat, free from dents, warp, wave, buckle. Corners shall be neatly formed and finished without horizontal or vertical seams showing on faces exposed in final installation. Reinforcing, cores or marks telegraphing through flat panels and surfaces will not be accepted.
- .2 Provide extruded PVC top closures on all exterior doors.
- .3 Doors shall be neat in appearance and free from warpage or buckle. Edge bends to be true and straight and of minimum radius for the thickness of metal used.
- .4 Bevel door edges 3.0 mm in 50 mm on lock and hinge edges.
- .5 Prepare doors to receive glazing and louvres where scheduled. Weld fixed glass molding to the secure side. Provide removable steel channel moldings to secure glazing and secure with security screws.
- .6 Attach fire-rated label to hinge side of door.
- .7 Pairs of fire rated labelled doors shall not require the provision of an overlapping astragal to attain the prescribed fire protection rating.

## **2.6 Fabrication – Glazed Openings**

- .1 Fabricate frames generally same as door frames.
- .2 Non-rated frames up to 1 square metre in area shall be 1.22 mm steel thickness; over 1 square metre shall be 1.52 mm steel thickness minimum.
- .3 Butt joints of mullions shall be coped accurately and fully welded to head and sill for maximum rigidity. Intermediate rails shall be similarly built to jambs and mullions.
- .4 Weld fixed glass molding to the secure side. Provide removable steel channel moldings to secure glazing and secure security screws. Refer also to Section 08 80 00.

## **2.7 Hardware Preparation**

- .1 Doors and frames shall be prepared to receive hardware as specified under Section 08 71 00.
- .2 Unless otherwise shown on the drawings, locate hardware in accordance with the Recommended Locations for Architectural Hardware as published by the Door and Hardware Institute.
- .3 Prepare doors and frames to receive electrified hardware supplied and installed under Section 08 71 00. Frame preparation shall include the application of shallow back boxes suitable for EMT termination at all device locations. Back boxes shall be welded to frames and shall be provided for all electrified devices including door position indicators. Back boxes shall be of sufficient size allowing for wiring, connectors, and the device to be properly installed in the mortise.
- .4 Door preparation shall include the installation of conduit or suitable wire raceway within door assemblies during fabrication. Coordinate all preparation requirements with Section 08 71 00 and Divisions 26 and 28.



**PART 3 EXECUTION**

**3.1 Inspection/Preparation**

- .1 Confirm site dimensions.
- .2 Ensure glazing stops and all loose parts and assemblies which are supplied by this section are packaged and identified clearly for installation by others.

**3.2 Installation**

- .1 The installation of frames in steel stud partitions is specified under Section 09 22 00.
- .2 Install frames in accordance with "Installation of Commercial Steel Doors and Frames" as published by the Door and Hardware Institute (DHI).
- .3 Set frames in concrete block walls in correct location, plumb, square and true. Maximum allowable variation: 1.5 mm out of plumb measured on face of frame, 3 mm twist corner to corner diagonally.
- .4 Brace frames securely. Anchor to floor and walls using anchorage provided. Provide temporary bracing to hold frames true while being built-in.
- .5 Provide temporary spreaders at mid- point of frame, and vertical brace for frames over 1200mm wide, until building-in work completed.
- .6 Assemble sectional and large size frames to provide smooth flush fitting joints, frame rigid and in line.
- .7 Loose-fill all exterior hollow metal door frames with thermal batt insulation. Refer to Section 07 21 00.

**3.3 Adjusting and Cleaning**

- .1 Touch up any damaged galvanized finish.
- .2 Remove mortar splatter and leave components ready for finishing by others.

**END OF SECTION**



**PART 1 GENERAL**

**1.1 Work Included**

- .1 Engineered design, shop fabrication and installation of:
  - .1 Aluminum Curtainwall systems;
  - .2 Integral Storefront door;
  - .3 Separate Aluminum Sliding Entrances;including glazing, extruded deflection head channels, associated flashings and closures, sill covers, anchorage, fixing of fasteners, compressible foam gasketing, caulking within frames and adaptors/coupling for interfacing with other components.

**1.2 Related Work**

- .1 Section 01 45 00 Quality Control
- .2 Section 05 50 00 Metal Fabrications
- .3 Section 07 21 00 Building Insulation
- .4 Section 07 27 13 Self-Adhering Membrane
- .5 Section 07 62 00 Sheetmetal Flashing & Trim
- .6 Section 07 90 00 Sealants
- .8 Section 08 80 00 Glazing

**1.3 References**

- .1 The current version of the following publications and standards:
  - .1 ANSI/ASTM E330, Test Method for Structural Performance of Exterior Windows, Curtain Walls and Doors by Uniform Static Air Pressure Difference.
  - .2 Architectural Aluminum Manufacturers Association (AAMA) 501-05.
  - .3 Glass Association of North America (GANA): Glazing Manual, Engineering Standards, Manual and Laminated Glazing Reference Manual.
- .2 Model National Energy Code for Buildings (NECB).
  - .1 NECB 2015.
- .3 National Building Code of Canada (NBCC), 2010.

**1.4 Submittals**

- .1 All submittals shall be in accordance with Section 01 33 00 – Submittal Procedures.
- .2 Product Data Sheets:
  - .1 Submit manufacturer's Product data sheets for products proposed for use in the work of this section.
- .3 Shop Drawings:
  - .1 Shop drawings shall be prepared under the supervision of and shall bear the seal of a professional engineer licensed in British Columbia.
  - .2 Further to requirements of Section 01 33 00, indicate with plans, sections, elevations and sufficient full size details, components and methods of assembly, materials and their characteristics relative to their purpose, and other fabrication information including relationships to adjacent systems.

- .3 Identify and describe material types being supplied, wall thicknesses of extrusions, and shapes including connections and grades, dimensions and tolerances (minimum and maximum), attachments, reinforcing, anchorage and locations of fastenings, air barrier transitions to various adjacent building envelope air barrier materials, and provisions for thermal and structural movement between components of this section and adjacent materials.
  - .4 Include description of materials, metal finishing specifications, and other pertinent information.
  - .5 Design loads, typical reactions and support movement allowances, both vertical and horizontal, shall be placed on the shop drawings.
  - .6 Shop drawings shall clearly indicate the specification of materials and, where applicable, indicate installation methods and coordination with other sections.
- .4 Letters of Assurance:
- .1 The Engineer who seals the shop drawings shall submit to the Consultant, with the initial shop drawings submission, an Assurance of 'Structural Design' and Commitment for 'Field Review' on HRDC Standard Form Schedule S. Written inspection reports of field review shall be submitted to the Consultant promptly as field reviews are made. On completion of the installation the Engineer shall submit to the Consultant an Assurance of Field Review and Schedule S.
- .5 Design Calculations:
- .1 Submit under seal, calculations prepared by the professional engineer responsible for the preparation of the shop drawings that clearly indicate the following:
    - .1 Design assumptions regarding loadings and seismic design, related to the building code.
    - .2 Which codes and standards calculations are based on.
    - .3 Materials proposed and their allowable shear and bending stresses.
    - .4 Maximum, and minimum tolerances for proposed materials including anchors, holes and spacing.
    - .5 Testing data to confirm compliance with thermal performance and condensation resistance criteria.
    - .6 Analysis for dead, wind, snow and guard loads as required and movements caused by temperature changes, support deflections and building sway.
    - .7 Analysis to include anchors, glazing members, structural joints, sealants glass. Show section property computations for framing members and submit full sized drawings.
  - .2 Calculations shall be prepared in a clear and comprehensive manner so that they can be easily reviewed. Incomplete or haphazard calculations will be rejected for resubmission.

- .6 Samples:
  - .1 Submit 450 mm x 450 mm size samples of each type of glass and aluminum framing finishes. If requested, submit 200 mm long samples of typical component sections (head, jamb, sill, meeting rail, and the like), fully assembled, indicating glazing and weatherproof methods.
- .7 Maintenance Instructions:
  - .1 Provide training to the Owner's Representative in the operation and maintenance of the aluminum curtainwall systems. Submit printed copies of maintenance instructions given to the Owner's Representative in accordance with Sections 01 78 30.
  - .2 Submit maintenance data for cleaning and maintenance of curtain walls for incorporation into the operation and maintenance manuals in accordance with Section 01 78 30.
- .8 Test Results Reports
  - .1 Submit valid independent laboratory test reports confirming compliance of proposed system with the specified laboratory test requirements. No work shall be fabricated until laboratory test requirements are demonstrated. Cost of testing shall be included in the work of this Section.

#### **1.5 Delivery, Storage and Handling**

- .1 Aluminum members shall be adequately wrapped to prevent damage during construction and shipping operations.
- .2 Aluminum shall be isolated from concrete, mortar, plaster and dissimilar metals with bituminous paint. Framing shall be protected from other building materials during and after installation until acceptance by the Consultant.
- .3 Packing, Shipping, Handling and Unloading: Deliver materials in manufacturer's original, unopened, undamaged containers with identification labels intact.
- .4 Storage and Protection: Store materials protected from exposure to harmful weather conditions. Handle material and components to avoid damage. Protect curtainwall material against damage from elements, construction activities, and other hazards before, during and after curtainwall installation.

#### **1.6 Quality Assurance**

- .1 Installer Qualifications: Installer experienced (as determined by Consultant) to perform work of this section who has specialized in the installation of work similar to that required for this project and who is acceptable to product manufacturer.
- .2 Manufacturer Qualifications: Manufacturer capable of providing field service representation during construction, approving acceptable installer and approving application method.
- .3 Exterior fenestration assemblies shall comply with the energy conservation requirements of NECB 2015.

#### **1.7 Design**

- .1 All design shall be executed under the direct supervision of a professional engineer licensed in British Columbia.
- .2 Design structural performance of glazing systems in accordance with National Building

Code of Canada (NBCC), 2015.

- .3 Conform to all Energy Efficient Standards of NECB 2015.

### **1.8 Curtainwall Performance Requirements**

- .1 Design total fenestration system to withstand local positive and negative wind pressures acting normal to all planes of assemblies in accordance with NBCC 2010 requirements including supplements, for a 60 second gust velocity with a probability of return of 1 in 10 years, but not less than the following minimum wind loads:
  - .1 Design wind pressure of 1.03 KPa.
  - .2 Design wind suction of 1.13 KPa.
- .2 Air infiltration: the test specimen shall be tested in accordance with ASTM E283. Air infiltration rate shall not exceed 0.06 cfm/ft<sup>2</sup> at a static air pressure differential of 6.24 psf.
- .3 Water resistance, (static): The test specimen shall be tested in accordance with ASTM E331. There shall be no leakage at a static air pressure differential of 12 psf as defined in AAMA 501.1.
- .4 Water resistance, (dynamic): The test specimen shall be tested in accordance with AAMA 501.1. There shall be no leakage at an air pressure differential of 12 psf as defined in AAMA 501.1.
- .5 Uniform Load: A static air design load as per NBCC 2010 shall be applied in the positive and negative direction in accordance with ASTM E330. There shall be no deflection in excess of L/175 of the span of any framing member at design load. At structural test load equal to 1.5 times the specified design load, no glass breakage or permanent set in the framing members in excess of 0.2% of their clear spans shall occur.
- .6 Seismic: When tested to AAMA 501.4, system must meet design displacement of 0.010 x the story height and ultimate displacement of 1.5 x the design displacement.
- .7 Condensation Resistance (CRF): When tested to AAMA Specification 1503.1, the condensation resistance factor shall not be less than 75 frame and 67 glass (low-e glass).
- .8 Attend field tests of representative areas of curtain wall selected by Consultant for water penetration by a recognized independent testing agent.
  - .1 Test areas as selected by Consultant, as described in Part 3 of this specification.

### **1.9 Energy Performance Requirements**

- .1 To be determined according to NECB 2015.
- .2 Fixed glazing, operable vents, and doors:
  - .1 Overall U-value: 2.4 W/m<sup>2</sup>K (0.422 BTU/hr/ft<sup>2</sup>/°F) or less.
  - .2 Solar Heat Gain Coefficient: 0.4 or less
  - .3 Form of Energy Performance Calculations: Provide WINDOWS computer simulated energy analysis for typical portion of curtain wall shown on drawings.

### **1.10 Warranty**

- .1 Provide a written warranty signed and issued in the name of the Owner stating that the aluminum curtainwall system will meet the performance requirements for a period of two (2) years from the date of Substantial Performance of the project provided, however, that said guarantee shall begin in no event later than six months from shipment date by the manufacturer.

## **PART 2 PRODUCTS**

### **2.1 Materials**

- .1 All materials shall be to ASTM B221 and AAMA / WDMA / CSA 101 / I.S.2 / A440-11. Extrusions shall be 6063-T5 or T6 alloy and temper. Formed aluminum components shall be of gauge, alloy and temper suitable for their application, finish and specified structural requirements.
- .2 Fasteners shall be 300/400 Series Stainless Steel and of sufficient size and quantity to perform their intended function and structural loading.
- .3 Weathering and Glazing Gaskets:
  - .1 To ASTM C864, extruded from a silicone – compatible EPDM rubber which provides for silicone adhesion.
- .4 Glazing tapes shall be macro-poly isobutylene, highly adhesive with continuous built-in shim at windows.
- .5 Thermal Barrier: Thermal break shall be manufacturer's standard strut type and tested in accordance with AAMA 505.
- .6 Perimeter anchors: Aluminum. When steel anchors are used (only use galvanized to G90 min.), provide insulation between steel material and aluminum material to prevent galvanic action.
- .7 Aluminum shall have isolation coating where required using Alkali-resistant Bituminous paint using dialectic separators where required.
- .8 Flashing shall be pre-formed to shapes and profiles shown or as required to insure a waterproof and air tight assembly. Material from aluminum alloy, to match framing/doors were exposed, mill finish elsewhere.
- .9 Sill flashings shall be back and end dammed and caulked into place, minimum 18 gauge.
- .10 Glass and Glazing: by type as specified in Section 08 80 00 and noted/scheduled on drawings.
- .11 Caulking and Sealants: to manufacturer's standard and to standards as specified in Section 07 90 00.
- .12 Perimeter Membrane: Refer to Section 07 27 13.

### **2.2 Aluminum Finishes**

- .1 Clear Anodized: Exposed aluminum sections shall be given an anodic oxide treatment in accordance with Aluminum Association Specification AA-M12C22A31, AAMA 611, Architectural Class II Clear Anodic Coating.

### **2.3 Product Source Quality Control**

- .1 Provide all aluminum framed glazing systems from a single source manufacturer:

### **2.4 Fabrication General**

- .1 Fabricate components as per manufacturer's instructions from extrusions of size and configuration as indicated on reviewed shop drawings and with minimum clearances and shim spacing around perimeter of assembly, yet enabling installation and dynamic movement of perimeter seal.
- .2 Accurately fit and secure joints and corners. Make joints flush, hairline and weatherproof.

- .3 All joints shall be accurately machined, assembled and sealed to provide a neat and weathertight assembly. Shielded drainage and pressure equalization vents shall be provided where required. All horizontal members shall be sealed to vertical members to provide individual compartments within the system in accordance with the rain screen principle.
- .4 Anchorage for curtainwall framing shall be located within the vertical tube sections or on the tube sides as strap anchors. The anchors shall be designed to allow for the thermal expansion and contraction of the frame. The design of the anchors must not interfere with the adhesion of the air seal membrane from the wall directly to the tube face of the section
- .5 Mechanically retain the perimeter air seal membrane to the tube face of the section with the use of aluminum anti-rotation channel.
- .6 Gaskets and weather seals shall be mechanically keyed in dry glazing systems for both interior and exterior applications (Visionstrip is not considered a mechanically keyed gasket.)
- .7 For all penetrations of the wall system (windows, doors and louvers): bridge the cavity of the wall by means of flashing (not by the use of the frame or cover cap). Do not caulk cover caps to flashing.

## **2.5 Aluminum Curtainwall (Standard Capped)**

- .1 As detailed, framing shall be 63.5mm X 152.4mm (verify for loading). Reinforce where and as required. All mullions shall be of uniform size. Employ special mullions as required.
- .2 Outside glazed with glass type as scheduled (refer to Section 08 80 00) with a pressure-plate format.
- .3 Provide 18-gauge aluminum sill flashing (finish to match curtainwall) formed as indicated , complete with end and back dams and fixing clips.
- .4 Accepted product: "1600UT Wall System by Kawneer. Products having the same characteristics produced by Columbia Aluminum Products, Alumicor or U.S. Aluminum will not be excluded.

## **2.6 Storefront Doors**

- .1 Exterior (building) storefront doors are hung, by means of adaptors, in Aluminum Curtainwall System (Section 08 44 00)
- .1 .2 Safety-glazed 57 mm thick thermally-broken tubular extruded aluminum "storefront" swing door with 127 mm stiles, top and lock rails and 165 mm bottom rails.
- .2 Door shall have dual moment welded corner construction and shall accommodate sealed double glazing (refer to Section 08 80 00).
- .3 Hardware: cylinders, mortised panic sets, mortised deadlocks and electric strikes shall be as supplied and scheduled by Section 08 71 00. This section shall supply the following hardware which is also scheduled in Section 08 71 00.
  - .1 Standard ball bearing NRP butt hinges. (Electrified where scheduled).
  - .2 Classic push/pulls where scheduled.
  - .3 Aluminum thresholds.
  - .4 Door closers where scheduled.
  - .5 Bulb polymeric weather stripping.
  - .6 Adjustable astragal pile weather stripping with polymeric fin at meeting stiles.



- .7 All exterior double and single aluminum storefront doors shall have full-height 3 mm thick aluminum astragals fixed to door stiles with tamperproof screws. Double doors with closers shall have coordinators mounted on interior.
- .4 An example of accepted product: "560 Insulclad Entrance Doors" (modified by addition of lockrail) by Kawneer. Other products having the same characteristics will not be excluded. Provide all aluminum framed glazing systems from a single source manufacturer.

## **2.7 Aluminum Sliding Entrances**

- .1 Kawneer NX-840 Sliding Glass Doors.
- .2 Brackets and Reinforcements: Manufacturer's standard high-strength aluminum with nonstaining, nonferrous shims for aligning system components.
- .3 Fasteners and Accessories: Manufacturer's standard corrosion-resistant, nonstaining, nonbleeding fasteners and accessories compatible with adjacent materials. Where exposed shall be stainless steel.
- .4 Perimeter Anchors: When steel anchors are used, provide insulation between steel material and aluminum material to prevent galvanic action.
- .5 **Glazing**
  - .1 Glass and Glazing Materials: Refer to Division 08 Section "Glazing" for glass units and glazing requirements applicable to glazed sliding aluminum-framed glass door units.
  - .2 Glazing System: Glazing method shall be a wet/dry type in accordance with manufacturer's standards. Exterior glazing shall be silicone back bedding sealant. Interior glazing shall be snap-in type glazing beads with an interior gasket in accordance with AAMA 702 or ASTM C864.
- .6 **Hardware**
  - .1 General: Provide manufacturer's standard hardware fabricated from aluminum, stainless steel, or other corrosion-resistant material compatible with aluminum; designed to smoothly operate, tightly close, and securely lock sliding aluminum-framed glass doors.
  - .2 Standard Hardware:
    - .1 One pair of zinc dichromate tandem rollers per sliding panel.
  - .3 Stainless steel roller track cover.
  - .4 Hookbolt lock: 1-point Hookbolt lock.
  - .5 Pull handle exterior: Finger pull.
  - .6 Pull handle interior: "D" pull

## **2.8 Accessories**

- .1 Provide thermally broken aluminum thresholds at doors.

## **PART 3 EXECUTION**

### **3.1 Examination**

- .1 Verify that all substrate conditions are acceptable for product installation in accordance with manufacturer's instructions. Verify that openings are sized to receive glazing systems and that sills are level in accordance with manufacturer's acceptable tolerances.

Report all unacceptable conditions to Consultant in writing immediately upon discovery.

- .2 Verify actual measurements/openings by field measurements before fabrication; show recorded measurements on shop drawings. Coordinate field measurements, fabrication schedule with construction progress to avoid construction delays.

### **3.2 Installation General**

- .1 Install all aluminum glazing systems in strict accordance with manufacturer's written instructions, reviewed shop drawings, specialty engineer's written directive, 2010 National Building Code of Canada, and good trade practice to yield a weathertight and safe installation.
- .2 Framing shall be installed, glazed and adjusted by experienced personnel employed by bonded installers. All items in the Section shall be set in their correct location and shall be set level, plumb without warp or rack and at proper elevations, and in alignment with other work.
- .3 Secure anchors and joints with provision for expansion and deflection of structure, concealed fixing.
- .4 Ensure that all interfacing of aluminum framing systems and air/vapour barriers is continuous, secure and effective.
- .5 Coordinate fabrication and installation of aluminum glazing system with work of other interfacing sections.
- .6 Dissimilar materials: provide separation of aluminum components from sources of corrosion or electrolytic action contact points.
- .7 Use sufficient corrosion resistant anchorage devices to securely and rigidly fasten glazed units to building, without causing detrimental effects to shape or performance.
- .8 Set glazed units sills level and uniform. Accurately and rigidly fit together all joints. Ensure joints are flush, hairline and weatherproof.
- .9 Caulking between glazed unit sections and materials installed by others: by this Section, as specified in Section 07 90 00.
- .10 This section shall do all necessary sealing within the glazed unit frames to ensure a weatherproof installation.
- .11 Extend foil faced self-adhering membrane flashing (Section 07 27 13, Clause 2.2) onto the curtainwall framing at the sill and jambs as detailed. Provide sheet aluminum backing to the membrane to prevent wind or pressure differential from blowing-out the membrane seal.
- .12 Extend Dow Corning 123 silicone seal onto curtainwall head framing to allow for movement.

### **3.3 Curtainwall Installation**

- .1 Both curtainwall types shall be outside glazed. Glass on curtainwall shall be secured by toggles on all four sides.
- .2 Water Drainage: Each light of glass shall be compartmentalized using joint plugs and silicone sealant to divert water to the horizontal weep locations. Weep holes shall be located in the horizontal framing members to divert water to the exterior of the building.
- .3 Field Testing: Field tests shall be in conformance with Section 01 45 00, part 1.4. Consultant will select wall units to be tested as soon as a representative portion of the project has been installed, glazed, perimeter caulked and cured. Conduct tests for air

infiltration and water penetration with manufacturer's representative present. Tests not meeting specified performance requirements and units having deficiencies shall be corrected as part of the contract amount.

- .4 Manufacturer's Field Services: Upon Owner's written request, provide periodic site visit by manufacturer's field service representative.

### **3.4 Glass and Glazing**

- .1 All aluminum framing systems shall be glazed as specified in Section 08 80 00.
- .2 Glazing as scheduled by type on drawings.
- .3 Safety glass where required by 2010 National Building Code of Canada.

### **3.6 Field Quality Control**

- .1 ref. also 01 45 00 – Quality Control
- .2 Conduct onsite tests for water infiltration with curtainwall manufacturer's representative present. The Consultant will select areas to be tested.
- .3 The installed performance of the curtain wall system, including the joint to other building components, to conform to:
  - .1 Water penetration: no uncontrolled water leakage through any part of the curtain wall when tested in situ according to ASTM E 1105 at an air pressure difference of 300Pa, when subjected to 5 cycles of 5 min.
- .4 Test curtain wall including perimeter joint and interface with adjacent building construction.
- .5 Test areas as selected by Consultant.
- .6 Correct deficiencies in joints which fail to meet specified requirements, and all joints having similar deficiencies, at no cost to the owner.
- .7 Provide all required air tight chambers as required to complete the field testing.

### **3.5 Protection and Cleaning**

- .1 Protection: Protect installed product's finish surfaces from damage during construction. Protect aluminum glazing systems from damage from grinding and polishing compounds, plaster, lime, acid, cement, or other harmful contaminants.
- .2 Cleaning: Repair or replace damaged installed products. Clean installed products in accordance with manufacturer's instructions prior to the Departmental Representative's acceptance. Remove construction debris from project site and legally dispose of debris.
- .3 At completion of the project, remove protection and clean and polish all surfaces.

END OF SECTION



**PART 1 GENERAL**

**1.1 Related Work**

- |    |                  |                      |
|----|------------------|----------------------|
| .1 | Section 01 45 00 | Quality Control      |
| .2 | Section 06 20 00 | Finish Carpentry     |
| .3 | Section 08 44 00 | Aluminum Curtainwall |

**1.2 References**

- .1 The current version of the following publications and standards:
  - .1 ANSI/ASTM E330, Test Method for Structural Performance of Exterior Windows, Curtain Walls and Doors by Uniform Static Air Pressure Difference.
  - .2 CAN/CGSB-12.1, Tempered or Laminated Safety Glass.
  - .3 CAN/CGSB-12.3, Float Glass.
  - .4 CAN/CGSB-12.4, Heat Absorbing Glass.
  - .5 CAN/CGSB-12.5, Mirrors, Silvered.
  - .6 CAN/CGSB-12.8, Insulating Glass Units.
  - .7 Laminators Safety Glass Association (LSGA) Standards Manual.
  - .8 Glass Association of North America (GANA): Glazing Manual, Engineering Standards, Manual and Laminated Glazing Reference Manual.
- .2 Model National Energy Code for Buildings (NECB).
  - .1 NECB 2015.
- .3 National Building Code of Canada (NBCC), 2010.

**1.3 Quality Assurance**

- .1 Professional Engineering:
  - .1 This section shall be responsible for providing engineering design necessary to supply glass thicknesses required to safely span openings indicated.
  - .2 A professional Engineer (Specialty Engineer), registered in British Columbia shall prepare, seal and sign all shop drawings and perform field reviews.
- .2 Standards:
  - .1 Comply with recommendations in the following publications, except where more stringent requirements are indicated. Refer to these publications for glazing terms not otherwise defined in this section:
    - .1 GANA Glazing Manual.
    - .2 GANA Engineering Standards Manual.
    - .3 GANA Laminated Glazing Reference Manual.
  - .2 Exterior fenestration assemblies shall comply with the energy conservation requirements of NECB 2015, prescriptive Path.
- .3 Manufacturing:

- .1 Fabrication processes, including low emissivity and reflective coatings, insulating, laminated, silk-screening and tempering shall be manufactured by a single manufacturer with a minimum of ten (10) years of fabrication experience and meet ANSI / ASQC 9002, latest version.
- .4 Installation:
  - .1 Provide the work of this section executed by specialist Contractor who shall be thoroughly trained and experienced in skills required, be completely familiar with referenced standards and requirements of the work of this section, and personally direct installation performed under this Section.
- .5 Conduct quality control in accordance with Section 01 45 00.

#### **1.4 Submittals**

- .1 All submittals shall be in accordance with Section 01 33 00 – Submittal Procedures.
- .2 Product data sheets:
  - .1 Submit manufacturer's product data sheets for products proposed for use in the work of this section
- .3 Shop drawings:
  - .1 Submit signed and sealed engineered shop drawings.
  - .2 Show details of each type of glazing system in conjunction with the framing system indicating type of glass, sizes, shapes, glazing material and quantity. Show details indicating glazing material, glazing thickness, bite on the glass and glass edge clearance.
- .4 Samples:
  - .1 Submit 305 mm ( $\pm$ ) square samples of each type of glass indicated except for clear monolithic glass products, and 305 mm long samples of each colour required, except black, for each type of sealant or gasket exposed to view.
    - .1 Submit 3 control samples for each glass type showing maximum range of visible difference between units for the project, if requested.
- .5 Submit test and evaluation reports:
  - .1 Obtain compatibility and adhesion test reports from sealant manufacturer indicating that glazing materials were tested for compatibility and adhesion with glazing sealant as well as other glazing materials including insulating units.
- .6 Manufacturer Reports:
  - .1 Submit glass fabricator's product information and structural calculations indicating compliance with glazing standards established by the Glass Association of North America (GANA). Submittal to include thermal stress and structural load analysis of the proposed glass types, configuration and sizes.

- .7 Submit sample glazing warranty.
- .8 If requested, submit copy of letter from IGMAC or a test report prepared by independent testing company confirming insulating glass units of the types required have been successfully tested in accordance with CAN/CGSB 12.8-97 and will withstand design loads specified herein.
- .9 Closeout Submittals:
  - .1 Submit closeout submittals in accordance with Section 01 78 30.
  - .2 Submit maintenance and cleaning instructions for glass and glazing for incorporation into the operating and maintenance manuals.

## **1.5 Performance / Design Criteria**

- .1 Glass strength:
  - .1 Provide glass products in the thickness and strengths (annealed or heat-treated) required to meet or exceed the following criteria based on project loads and in-service conditions.
    - .1 Analysis shall comply with CAN/CGSB 12.20, latest edition.
    - .2 Minimum thickness of annealed or heat-treated glass products shall be selected so that worst case probability of failure does not exceed the following:
      - .1 8 breaks per 1000 for glass installed vertically less than 15 degrees from the vertical plane and under wind action.
      - .2 1 break per 1000 for glass installed 15 degrees or more from the vertical plane and under action of wind and/or snow.
    - .3 Maximum lateral deflection sealed double vision glass units: for insulating glass units supported on four edges, limit centre-of-glass deflection at design wind pressure to not more than 1/50 times the short-side length or 19 mm maximum.
- .2 Safety and Building Code:
  - .1 At locations subjected to human impact loads and where required by NBCC, 2010: provide safety glass in accordance with the latest revisions to CAN/CGSB 12.1 and 12.20.
  - .2 Glass thicknesses and glass types specified, indicated, or scheduled are minimums required. Glazing "Specialty Engineer" shall modify as required to satisfy design and building code requirements, and any such modifications shall be clearly indicated on shop drawings.
- .3 Thermal and Optical performance:
  - .1 Provide glass products with performance properties published by glass manufacturer. Performance properties shall be manufacturer's published data as determined according to the following procedures:
    - .1 Centre of glass U-Value: National Fenestration Rating Council (NFRC) 100 methodology using LBNL WINDOW 5.2 computer program.
    - .2 Centre of glass solar heat gain coefficient: NFRC 200 methodology using LBNL-35298 WINDOW 5.2 computer program.
    - .3 Solar optical properties: NFRC 300.

- .4 Sealed Double Vision Glass Units:
  - .1 IGMAC Certified, hermetically sealed, to CAN/CGSB 12.8 (latest) minimum 12 mm air space, 90% argon/10% air filled, double sealed edges (primary: polyisobutylene, secondary: polysulphide), desiccant filled stainless steel spacer bar.
    - .1 There shall be no voids or skips in the primary seal or the secondary seal.
  - .2 Performance requirements: for glass units; based on above description:
    - .1 Visible light transmittance (VLT): within 68 – 70%.
    - .2 Winter night-time U-value: 0.24.
    - .3 Low 'E' soft coating (equal to Cardinal "LoE-366") on No. 2 surface.
    - .4 Solar heat gain coefficient (SHGC): 0.40.
    - .5 Exterior pane: uncoated green tinted glass with average daylight transmittance of 75 percent.

## **1.6 Storage and Handling**

- .1 Protect glass from edge damage during handling. For insulating units exposed to substantial altitude changes, comply with insulating glass manufacturers written recommendations for venting and sealing to avoid hermetic seal ruptures.
- .2 Storage and protection: Protect glazing materials according to manufacturer's written instructions and as needed to prevent damage to glass and glazing materials from condensation, temperature changes, direct exposure to sun or other causes.

## **1.7 Site Conditions**

- .1 Ambient Conditions: do not proceed with glazing when ambient and substrate temperature conditions are outside limits permitted by the glazing material manufacturers and when glazing channel substrates are wet from rain, frost, condensation or other causes.
- .2 Do not install liquid glazing sealants when ambient and substrate temperature conditions are outside limits permitted by glazing sealant manufacturer or below 4.4°C.

## **PART 2 PRODUCTS**

### **2.1 Glass Type Descriptions**

- .1 Type "1"  
Float glass – Clear glazing quality to CAN/CGSB-12.3 (latest). Of thicknesses as determined by "specialty engineer" to meet loading and building code requirements.
- .2 Type "2" (Safety Glass)
  - .1 Single glazed, clear (or tinted) tempered safety glass, (Engineer-verified thicknesses for spans indicated) transparent tempered float glass to CAN2-12.1 (latest), Type 2, Class B.
  - .2 Tempering shall be performed using convection type furnace.
  - .3 Tempered and heat strengthened glass shall be treated prior to applying reflective or paint coatings.



- .4 Tempering shall be performed using the horizontal tong-free method.
- .5 Orient tempered glass in manner to produce consistent appearance.
- .3 Type "3" (Sealed Double Vision Glass)
  - .1 Sealed double vision glazing, pane thicknesses as determined by "Specialty Engineer" to NBC Code requirements. (Use Type "2" glass where required by building code). Green tinted (to match approved samples) outboard lite, clear inboard lite with Low "E" coating on No. 2 surface.
- .4 Type "4" (Sealed Double Acoustical Glass)
  - .1 Sealed double vision glazing, pane thicknesses as determined by Specialty Engineer to NBC Code requirements. (Use Type "2" glass where required by code). 6 mm green tinted (to match approved samples) outboard lite, laminated inboard lite from two 3 mm clear float glass panes with 0.030 PVB interlayer.
- .5 Type "5" (Sealed Double Security Glass)
  - .1 Sealed double vision glazing, outboard pane: two laminated 3 mm sheets of clear tempered safety glass with a minimum 0.76 mm thick fully bonded, high impact, UV resistant clear Polyvinyl Butyral (PVB) interlayer. Inboard pane: 6 mm clear tempered glass with low "E" coating on No. 2 surface.

## **2.2 Glazing Materials**

- .1 Glazing materials: general: Select glazing sealants, tapes, gaskets and additional glazing materials of proven compatibility with other materials they will contact, including glass products, seals of insulating glass units and glazing channel substrates, under conditions of installation and service, as demonstrated by testing and field experience.
- .2 Glazing gaskets: Moulded or extruded gaskets of profile and hardness required to maintain watertight seal, made from one of the following:
  - .1 Performed, EPDM, silicone compatible, to ASTM C864-05.
- .3 Setting blocks: Silicone material with Shore, Type A durometer hardness of 85, plus or minus 5.
- .4 Spacers: Silicone blocks or continuous extrusions of hardness required by glass manufacturer to maintain glass lites in place for installation indicated.
- .5 Edge blocks: Silicone material of hardness needed to limit glass lateral movement (side walking).
- .6 Cleaners, Primers and Sealers: Type recommended by sealant or gasket manufacturer.
- .7 Sealants: Glazing sealants are to be neutral cure silicone and must be compatible with each other and all must be compatible with the insulating glass unit sealant.

## **PART 3 EXECUTION**

### **3.1 Examination**

- .1 Examine framing, glazing channels, and stops, with glazing installer present, for compliance with the following:
  - .1 Manufacturing and installation tolerances, including those for size, squareness, and offsets at corners.

- .2 Inspect butt and mitre joints in framing. Seal joints found to be open with a compatible sealant prior to glazing.
  - .3 Glazing pockets and surfaces are free of dust, construction debris, and contaminants.
  - .4 Presence and functioning of weep systems.
  - .5 Minimum required face and edge clearances.
  - .6 Effective sealing between joints of glass-framing members.
- .2 Proceed with installation only after unsatisfactory conditions have been corrected.

### **3.2 Preparation**

- .1 Clean glazing channels and other framing members receiving glass immediately before glazing. Remove coatings not firmly bonded to substrates.
- .2 Examine glazing units to locate exterior and interior surfaces. Label or mark units as needed so that exterior and interior surfaces are readily identifiable. Do not use materials that will leave visible marks in the completed work.
- .3 Clean contact surfaces with solvent and apply primers to surfaces to receive tapes and sealants in accordance with the manufacturer's instructions. Ensure surfaces are free of moisture and frost.

### **3.3 Glazing - General**

- .1 Comply with combined written instructions of manufacturers of glass, sealants, gaskets, and other glazing materials, unless more stringent requirements are indicated, including those in referenced glazing publications.
- .2 Adjust glazing channel dimensions as required by conditions during installation to provide necessary bite on glass, minimum edge and face clearances, and adequate sealant thicknesses, with reasonable tolerances.
- .3 Protect glass edges from damage during handling and installation. Remove damaged glass from project site and legally dispose of off project site. Damaged glass is glass with edge damage or other imperfections that, when installed, could weaken glass and impair performance and appearance.
- .4 Clean glazing rebate surfaces of traces of dirt, dust, or other contaminants.
- .5 Apply primers to joint surfaces where required for adhesion of sealants, as determine by preconstruction testing.
- .6 Install setting blocks in sill rabbets, sized and located to comply with referenced glazing publications, unless otherwise required by glass manufacturer. Set blocks in think course of compatible sealant suitable for heel bead.
- .7 Do not exceed edge pressures stipulated by glass manufacturers for installing glass lites.
- .8 Provide spacers for glass lites where length plus width is greater than 1270 mm.
  - .1 Locate spacers directly opposite each other on both inside and outside faces of glass. Install correct size and spacing to preserve required face clearances, unless gaskets and glazing tapes are used that have demonstrated ability to maintain required face clearances and to comply with system performance requirements.

- .2 Provide 3.2 mm minimum bite of spacers on glass and use thickness equal to sealant width.
- .9 Provide edge blocking where indicated or needed to prevent glass lites from moving sideways in glazing channel.
- .10 Set glass lites in each series with uniform pattern, draw, bow, and similar characteristics.
- .11 Set glass lites with proper orientation so that coatings face exterior or interior as specified.
- .12 Hollow Metal Doors and Frames: Specified under work of Section 08 11 00. Install glazing as scheduled. Fixed stop bedding, glazing tape, removable stops, glazing tape.

### **3.4 Gasket Glazing (Dry)**

- .1 Cut compression gaskets to lengths recommended by gasket manufacturer to fit openings exactly, with allowance for stretch during installation.
- .2 Insert soft compression gasket between glass and frame or fixed stop so it is securely in place with joints miter cut and bonded together at corners.
- .3 Installation with drive-in wedge gaskets: Centre glass lites in openings on setting blocks and press firmly against soft compression gasket by inserting dense compression gaskets formed and installed to lock in place against faces of removable stops. Start gasket applications at corners and work toward centres of openings. Compress gaskets to produce a weathertight seal without developing bending stresses in glass. Seal gasket joints with sealant recommended by gasket manufacturer.
- .4 Installation with Pressure-Glazing Stops: Centre glass lites in openings on setting blocks and press firmly against soft compression gasket. Install dense compression gaskets and pressure glazing stops, applying pressure uniformly to compression gaskets. Compress gaskets to produce a weathertight seal without developing bending stresses in glass. Seal gasket joints with sealant recommended by gasket manufacturer.
- .5 Install gaskets so they protrude past face of glazing stops.

### **3.5 Sealant Glazing (Wet)**

- .1 Install continuous spacers, or spacers combined with cylindrical sealant backing, between glass lites and glazing stops to maintain glass face clearances and to prevent sealant from extruding into glass channel and blocking weep systems until sealants cure. Secure spacers or spacers and backings in place and in position to control depth of installed sealant relative to edge clearance for optimum sealant performance.
- .2 Force sealants into glazing channels to eliminate voids and to ensure complete wetting or bond of sealant to glass and channel surfaces.
- .3 Tool exposed surfaces of sealants to provide a substantial wash away from glass.

### **3.6 Mirror Installation**

- .1 Install mirrors where indicated using concealed fixing ("Vancouver Clips") and adhesive applied in maximum 300 x 300 mm grid for seismic restraint

### **3.7 Protection**

- .1 Provide safety markings to installed glass by attaching streamers or tape to face of sash. Do not apply tape directly to the glass. Do not mark the glass with paint or any other substance that is hard to remove or could leave permanent stains.

- .2 Take all precautions necessary to protect stored glass and installed glass from lime mortar, water run-off from concrete or copper, weld spatter, acids, roofing tar, solvents, abrasive cleaners, careless handling of construction machinery and equipment, and any other activities that could permanently damage the glass.
- .3 Install protective cover to glass where there is a high risk of damage. Use plywood, heavy kraft paper, or non-staining transparent plastic sheet. Do not let protective materials contact surface of glass.
- .4 Do not rely on use of adhesive plastic films to protect installed glass. When plastic sheeting is used, it must be transparent, suspended away from the surface of the glass, and be provided with adequate ventilation holes to prevent heat build-up.

### **3.8 Finishing**

- .1 Immediately remove sealant and compound droppings from finished surfaces. Remove labels after work is completed.
- .2 Final cleaning of glass in accordance with Section 01 74 00.

END OF SECTION

**PART 1 GENERAL**

**1.1 Work Included**

- .1 Interior steel studs, metal detailed framing, metal furring channels, floor and ceiling track and associated accessories, including design and engineering.
- .2 Installation of hollow metal door frames in steel stud partitions.

**1.2 Related Work**

- .1 Section 06 10 00 Rough Carpentry
- .2 Section 07 90 00 Sealants
- .3 Section 09 29 00 Gypsum Board

**1.3 Standard Specifications**

- .1 Unless otherwise shown or specified, materials and workmanship shall meet the standards detailed in the Specification Standards Manual of the British Columbia Wall and Ceiling Industry.
- .2 Where standards are outlined herein, it will not preclude the use of other standards included in the Specification Standards Manual where such standards are approved in writing by the Consultant.
- .3 Reference in these project specifications to Section numbers, Parts, and Item numbers, means those within Section 9.7 of the Specification Standards Manual.

**1.4 Design of Steel Studs Systems**

- .1 This section shall be responsible for the engineering design of the steel stud systems.
- .2 Steel stud systems and connections shall be designed in strict accordance with CAN/CSA S136-01.
- .3 The stud wall system shall be designed to support lateral & gravity loadings as prescribed in the NBCC 2015.

**1.5 Submittals**

- .1 All submittals shall be in accordance with Section 01 33 00 – Submittal Procedures.
- .2 Shop Drawings:
  - .1 Submit shop details and erection drawings showing stud gauges, sizes, fastening, configuration, etc.
  - .2 Each drawing submission shall bear the signature and stamp of qualified professional engineer registered in the British Columbia. (Specialty Engineer).
  - .3 Submit sealed HRDC Schedules B-1, B-2, and C-B.

**PART 2 PRODUCTS**

**2.1 Steel Studs**

- .1 As specified in BCWC Section 9.7, Part 2, Items 1 & 2 to ASTM C645-76.

- .2 Galvanized steel studs, width and gauge as per Specialty Engineer.
- .3 Use min. 20 gauge galvanized steel studs (doubled) at door jambs.
- .4 Supply special extended leg head track on walls subjected to deflection of the structure above.
- .5 Bottom track as per Specialty Engineer.
- .6 (Nested) top track as per Specialty Engineer.

## **2.2 Furring Channels**

- .1 As specified in BCWC Section 9.7, Part 2, Item 3.
- .2 Min. 25 ga. galvanized steel hat shaped channels with knurled face 22 mm thick.

## **PART 3 EXECUTION**

### **3.1 Installation Steel Studs**

- .1 Install steel and stud partitions in accordance with BCWC standards.
- .2 Use doubled 20 Ga. thick studs each side of door frames.
- .3 Use double walls where required to accommodate piping, ducts, exist. wall thicknesses, etc.
- .4 Install access panels for other trades where directed.
- .5 Note miscellaneous interior framing.
- .6 Use extended leg ceiling track in areas where deflection of structure will be present.

**3.2 Installation Vertical & Horizontal Furring**

- .1 Install vertical and horizontal furring in accordance with BCWC Section 9.7, Part 3, Item 4 spaced 400 mm o.c. maximum.

**3.3 Installation Ceiling Suspension System**

- .1 Install ceiling suspension system in accordance with BCWC Section 9.2, Part 3, Item 5.

END OF SECTION





**PART 1 GENERAL**

**1.1 Related Work**

- |    |                  |                              |
|----|------------------|------------------------------|
| .1 | Section 01 45 00 | Quality Control              |
| .2 | Section 07 21 00 | Insulation                   |
| .3 | Section 07 90 00 | Sealants                     |
| .4 | Section 09 22 00 | Non-structural Metal Framing |

**1.2 Reference Standards**

- .1 ASTM C 473 Standard Test Methods for Physical Testing of Gypsum Panel Products.
- .2 ASTM C 518 Standard Test Method for Steady-State Thermal Transmission Properties by Means of the Heat Flow Meter Apparatus.
- .3 ASTM C 630 Standard Specification for Water-Resistant Gypsum Backing Board.
- .4 ASTM C 840 Standard Specification for Application and Finishing of Gypsum Board.
- .5 ASTM C 1177 Standard Specification for Glass Mat Gypsum Substrate for Use as Sheathing.
- .6 ASTM C 1396 Standard Specification for Gypsum Board.
- .7 ASTM C 3273 Standard Test Method for Resistance to Growth of Mold on the Surface of Interior Coatings in an Environmental Chamber.
- .8 ASTM C 84 Standard Test Methods for Surface Burning Characteristics of Building Materials.
- .9 Unless otherwise shown or specified, materials and workmanship shall meet the standards detailed in the Specification Standards Manual of the British Columbia Wall and Ceiling Industry and printed matter issued by the product manufacturers.
- .10 Where standards are outlined herein it will not preclude the use of other standards included in the Specification Standards Manual where such standards are approved in writing by the Departmental Representative.
- .11 Reference in these project specifications to Section numbers, Parts, and Item numbers means those within Section 9.6 of the Specification Standards Manual.
- .12 National Building Code of Canada (NBCC), 2010.

**1.3 Quality Assurance**

- .1 Contractor executing the work of this section shall have a minimum of 10 years continuous experience in successful installation of work of type and quality indicated and specified.
- .2 Single source responsibility: Obtain gypsum board products from a single manufacturer, or from manufacturers recommended by the prime manufacturer of gypsum boards.
- .3 Provide gypsum board materials that comply with the following limits for surface burning characteristics when tested as per ASTM E84:
  1. Flame spread: 25, maximum.

**1.4 Submittals**

- .1 All submittals shall be in accordance with Section 01 33 00 – Submittal Procedures.
- .3 Product Data Sheets:
  - 1. Submit manufacturer's product data sheets for products proposed for use in the work of this section.
- .4 Fire-Rated Assembly Listings:
  - 1. Submit fire-rated assembly listings for each required fire resistance rated assembly for work of this section.

**1.5 Environmental Requirements**

- .1 Environmental requirements, general: Comply with requirements of referenced gypsum board application standards and recommendations of gypsum board manufacturer, for environmental conditions before, during and after application of gypsum boards.
- .2 Cold Weather Protection: When ambient outdoor temperatures are below 12°C maintain continuous, uniform comfortable building working temperatures of not less than 12°C for a minimum period of 48 hours before, during and following application of gypsum board and joint treatment materials or bonding of adhesives.
- .3 Ventilation: Ventilate building spaces as required to remove water in excess of that required for drying of joint treatment material immediately after its application. Avoid drafts during dry, hot weather to prevent too rapid drying.
- .4 Protection: Provide adequate protection of materials and work of this section from damage by weather and other causes. Protect work of other trades from damage resulting from work of this section. Make good such damage at no additional cost to the Departmental Representative.

**1.6 Delivery, Storage and Handling**

- .1 Store materials in protected dry areas. Store gypsum board flat in piles with edges protected.
- .2 Ensure that finish metal members are not bent, dented, or otherwise deformed.
- .3 Deliver products supplied under the work of this section only to those who are responsible for installation, to the place they direct, and to meet installation schedules.
- .4 Package fire rated materials with labels attached.

## **PART 2 PRODUCTS**

### **2.1 Gypsum Board (Interior)**

- .1 Standard gypsum board: paper faced gypsum core panel solid set core enclosed in paper, 16 mm thick unless otherwise indicated, 1220 mm wide x maximum practical length, ends square cut, tapered edges, to ASTM C1396/C1396M-06a. Mold and moisture resistant.
- .2 Fire-rated gypsum board: paper faced gypsum core panel, 16 mm thick, with a specially formulated core for use in fire-resistive Type X or Type C designs, to ASTM C1396/C1396M-06a. Mold and moisture resistant.
- .3 Gypsum ceiling board: paper faced gypsum core, to ASTM C1396/C1396M-06a, (non-sag type equivalent to 15.9 mm interior ceiling grade). Mold and moisture resistant.
  - .1 Acceptable products:
    - .1 CertainTeed 'ProRoc Interior Ceiling'.
    - .2 CGC 'Interior Gypsum Ceiling Board'.
    - .3 Georgia-Pacific 'ToughRock CD Gypsum Board'.

### **2.2 Paperless Gypsum Board (Interior)**

- .1 For use as tile backerboard, wall and ceiling board in moist areas and where otherwise scheduled.
- .2 Gypsum wallboard faced with FRP glass mats in lieu of paper producing moisture and mold resistance when tested by ASTM C1178/C1178M-06 procedures. Use fire-resistant (Type 'X'), to ASTM C1658/C1658M-06, where indicated and required for fire resistance rating.
- .3 Physical properties of board:
  - .1 Thickness: 15.9 mm.
  - .2 Width: 1219 mm.
  - .3 Length: longest practical length available.
  - .4 Weight: 2020 pounds per M square foot.
  - .5 Edges: Tapered.
  - .6 Surfacing: Coated glass mat on face, back, and long edges.
  - .7 Flexural Strength, Parallel (ASTM C473, ASTM C1177): Not less than 80 pounds.
  - .8 Flexural Strength, Perpendicular (ASTM C473, ASTM C1177): Not less than 100 pounds.
  - .9 R-Value (ASTM C 518): Not less than 0.56.
  - .10 Nail Pull Resistance (ASTM C473, ASTM C1177): Not less than 80 pounds.
  - .11 Hardness, Core, Edges, and Ends (ASTM C473, ASTM C1396): Not less than 15.
  - .12 Water Absorption (ASTM C473, ASTM C630, and ASTM C1396): Less than 5% of weight.

**2.3 Exterior Sheathing Board**

- .1 Exterior grade fiberglass mat faced on front and back sides and long edges, silicone-treated water-resistant gypsum core, to ASTM C1177/C1177M-06, fire rated where indicated.
- .2 Exposure to weather: Comply with manufacturer's printed instructions. Provide protection prior to exposure for periods greater than manufacturer's recommendations and warranty.
- .3 Acceptable products:
  - .1 CertainTeed 'GlasRoc Sheathing'.
  - .2 CGC 'Securock Glass-Mat Sheathing'.
  - .3 Georgia-Pacific 'Dens-Glass Gold'.

**2.4 Exterior Roof Sheathing**

- .1 Nonstructural, noncombustible, fibreglass-embedded, moisture resistant gypsum core panel in accordance with ASTM C 1177, Minimum thickness of 13 mm thick unless noted otherwise, 1200 mm wide x maximum practical length.
- .2 Acceptable Product: DensDeck Prime Roof Board by Georgia Pacific

**2.4 Metal Furring & Suspension Systems**

- .1 Metal furring runners, hangers, tie wires, inserts, anchors: to CSA A82.30-M1980, galvanized.
- .2 Drywall furring channels: 0.5 mm core thickness galvanized steel channels for screw attachment of gypsum board.
- .3 Resilient clips drywall furring: 0.5 mm base steel thickness galvanized steel for resilient attachment of gypsum board.

**2.5 Adhesives**

- .1 Laminating compound: to CSA A82.31.

## **2.6 Accessories**

- .1 Casing Beads: 0.5 mm base thickness commercial grade sheet steel with G90 zinc finish to ASTM A525-80A, perforated flanges; one piece length per location.
- .2 Acoustic Sealant: to CGSB 19-GP-21M. Sealants acceptable for use on this project must be listed on CGSB Qualified Products List issued by CGSB Qualification Panel for Joint Sealants.
- .3 Joint Compound: to CSA A.82-31-M1980, asbestos free.
- .4 Corner Beads: 32 x 32 mm, 6063-T5 aluminum alloy.
- .5 Continuous 6-mil Poly Vapour Barrier.
- .6 Rubber base, to match existing adjacent installation.

## **2.7 Fastening and Finishing**

- .1 Nails, screws, tape, joint compound, and taping compound as specified in Section 9.5, Part 2, Item 2 of the Specification Standards Manual and the board manufacturer's printed instructions.
- .2 Corner beads, casing beads as specified in Section 9.6, Part 2, Item 3 of the Specification Standards Manual and the board manufacturer's printed instructions.

## **2.8 Fastening**

- .1 Nails, screws, and staples: to ASTM C380.

# **PART 3 EXECUTION**

## **3.1 Interior Gypsum Wallboard Application**

- .1 Apply drywall in accordance with ASTM C 840, Section 9.6, Part 3, Item 6 of the Specification Standards Manual and printed instructions issued by the board manufacturer.
- .2 Gypsum wallboard shall be attached to metal studs, furring or ceiling channels by screw application.
- .3 Gypsum wallboard shall be attached to concrete or masonry by adhesive.
- .4 Use fire resistant gypsum wallboard (Type X) for fire rated walls and ceilings applied in accordance with U.L.C. design for fire rating required.
- .5 Apply paperless drywall to damp and wet areas, as tile backerboard and where noted and scheduled.

## **3.2 Corner Beads & Casing Beads**

- .1 Install corner beads and casing beads in accordance with Section 9.6, Part 3, Item 11 of the Specification Standards Manual.

## **3.3 Finishing and Joint Treatment**

- .1 Finish field joints, internal angles, screw heads, beads and trim in accordance with Section 9.6, Part 3, Item 4.1 of the Specification Standards Manual for a Level 5 finish.

### **3.4 Sound Retardant Application**

- .1 Where scheduled and detailed:
  - .1 Install foam gasket tape in joint between ceiling track and ceiling soffit.
  - .2 Install sound insulation blankets between studs full height of partition, tightly fitted to studs, electrical boxes, ducts and other penetrations.
  - .3 Install a 10 mm continuous bead of acoustical sealant between joint of gypsum wallboard and floors or abutting vertical surfaces.

### **3.5 Grouting of Metal Door Frames**

- .1 During drywall application, grout metal door frames solid with hardwall plaster grout.
- .2 Mix grout in proportions of 1 part hardwall plaster to 2-1/2 parts by weight of sand.

### **3.6 Patching and Pointing**

- .1 Point and patch drywall and leave work complete and ready for painting.

### **3.7 Accessories**

- .1 Erect accessories straight, plumb or level, rigid and at proper plane. Use full length pieces where practical. Make joints tight, accurately aligned and rigidly secured. Mitre and fit corners accurately, free from rough edges. Secure at 150 mm o.c. using contact adhesive for full length.
- .2 Install casing beads where gypsum board butts against surfaces having no trim concealing junction and where indicated. Seal joints with sealant.

### **3.8 Trim**

- .1 Minimize joints; use corner pieces and splicers.

### **3.9 Access Doors**

- .1 Install access doors to electrical and mechanical fixtures specified in respective sections, and where noted.
- .2 Rigidly secure frames to furring or framing systems.

### **3.10 Exterior Wall Sheathing Application**

- .1 Fasten wall sheathing board to structural metal studs and framing in compliance with board manufacturer's written instructions and NBCC, 2015.
- .2 Do not apply sheathing board until steel stud framing, anchors and blocking work are approved.
- .3 Install sheathing to metal framing with screws spaced at 200 mm o.c. at perimeter and 300 mm o.c. in field (200mm o.c. in field for soffit locations and when girts are not used).
- .4 Perimeter screws shall not be less than 9mm nor more than 12mm from edges and ends and shall be opposite the screws on adjacent boards.
- .5 Drive fasteners to bear tight against and flush with surface of sheathing. Do not countersink.
- .6 Use maximum lengths possible to minimize number and placement of joints. Locate edge joints parallel to and with vertical orientations on framing. Stagger intermediate end joints of adjacent lengths of sheathing. Make joints tight, accurately aligned

and rigidly secured. Particular care to taken at wall corners which are not at 90 degrees to obtain snug joint with maximum gap of 3mm.

- .7 Typical board joints to be tight to provide continuous support for the self adhered membrane. Board joints at base of slab to provide 3/8" joint for deflection or as required, and to be supported by metal supports and blocking as indicated.
- .8 For sheathing supporting self adhered membrane, fill all joints greater than 5/16" (8mm) with cementitious filler.

### **3.11 Clean-up**

- .1 Clean-up rubbish daily and take care to avoid defacing adjoining work.

END OF SECTION





**PART 1 GENERAL**

**1.1 Work Included**

- .1 This section of work shall include all labour, materials, tools, scaffolds and other equipment, services and supervision required to prepare surfaces and to cover them with paint and/or transparent finish as herein specified and as shown on the "Finish Schedule", to the full intent of the specifications.

**1.2 Work Excluded**

- .1 All factory and pre-finished items not scheduled and specified for painting.
- .2 Shop-finished millwork and other components shall conform to these specifications.

**1.3 Related Sections**

- .1 Section 05 50 00 Metal Fabrications
- .2 Section 06 20 00 Finish Carpentry
- .3 Section 09 29 00 Gypsum Board

**1.4 References**

- .1 The Master Painters Institute (MPI) Maintenance Repainting and Architectural Painting Specification Manuals, current edition.
- .2 Shop-finished millwork shall conform to these specifications.

**1.5 Submittals**

- .1 All submittals shall be in accordance with Section 01 33 00 – Submittal Procedures.
- .3 If requested by the Consultant, provide for approval a 300 x 300 mm sample of each colour on the actual base material. Colours shall be exact shade, texture and gloss value.
- .4 All colours shall be as selected by Consultant.

**1.6 Quality Assurance**

- .1 The paint products of the Paint Manufacturer shall be as listed in the MPI Architectural Painting Specification Manuals (latest edition), under "Paint Product Recommendation" section, or approved equivalent.
- .2 This contractor shall have a minimum of five (5) years proven satisfactory experience, and shall maintain a qualified crew of painters throughout duration of the work who shall be qualified to fully satisfy the requirements of this specification. Only qualified journeymen (and apprentices) shall be engaged in painting and decorating work who have a provincial Tradesman Qualification certificate of proficiency.
- .3 This work section requires full cooperation at all times with the MPDA (MPI) in the performance of its duties.

### **1.7 Mock-Up**

- .1 Before proceeding with final paint application, finish one (1) room in each approved colour scheme in actual finish texture materials and workmanship for review by the Consultant.
- .2 After approval, this mock-up area to serve as the standard of quality for all work throughout the building.

### **1.8 Product Handling**

- .1 Paint materials shall be delivered to the job site in sealed original labeled containers bearing manufacturer's name, type of paint, brand name, designation and instruction for mixing and/or reducing.
- .2 The Contractor shall provide adequate storage facilities. Paint materials shall be stored at a minimum ambient temperature of 7°C in a well ventilated and heated single designated area.
- .3 Take all necessary precautionary measures to prevent fire hazards and spontaneous combustion.
- .4 Where toxic materials and both toxic and flammable solvents are used, appropriate precautions shall be taken and no smoking allowed as a regular procedure.

### **1.9 Environmental Conditions**

- .1 Temperature, humidity and moisture content shall conform to the following:

<b>Temperature:</b>	No painting shall be performed when temperature on the surfaces, or the air in the vicinity of the painting work are below 5°C (41°F) for interior work and 10°C (50°F) for exterior work.
<b>Relative Humidity:</b>	Shall not be higher than 85%.
<b>Moisture of Surfaces:</b>	Tests shall be done by electronic "Moisture Metre".
<b>Plaster and Wallboard:</b>	Maximum moisture content 12%.
<b>Masonry/Concrete:</b>	Maximum moisture content 12% for solvent type paint. Masonry surfaces may be tested for alkalinity.
<b>Wood:</b>	Maximum moisture content 12%.
- .2 Proper lighting shall be the Contractor's responsibility.
- .3 All areas where painting and coating work is proceeding require adequate continuous ventilation and sufficient heating facilities to maintain temperatures above 7°C (45°F) for 24 hours before and after paint application. Required heat and ventilation shall be provided by the Contractor.

### **1.10 Protection**

- .1 Adequately protect other surfaces from paint and damage and make good any damage caused by failure to provide suitable protection, but this section will not be responsible for any damage caused by others.
- .2 Furnish sufficient drop cloths, shields and protective equipment to prevent spray of dropping from fouling surfaces not being painted and in particular, surfaces within the storage and preparation area.

- .3 Cotton waste, cloths and material, which may constitute a fire hazard, shall be placed in closed metal containers and removed daily from the site.
- .4 Remove all surface hardware, electrical plates, fittings, fastenings, etc. prior to painting operation. These items shall be carefully stored, cleaned and replaced on completion of work in each area.

#### **1.11 Scheduling**

- .1 Schedule painting operations to prevent disruption of and by other trades.

#### **1.12 Inspection and Guarantee**

- .1 Upon completion of the work, provide a Master Painter's and Decorator's Association two (2) year guarantee, or alternatively a 2 year maintenance bond to the full value of the painting subcontract, both in accordance with the MPI painting manual requirements.
- .2 During work, an inspector acceptable to the Consultant shall inspect work for compliance with specifications and standards of the MPI, whether using the MPI guarantee or the maintenance bond option.
- .3 Provide regular inspection reports to the Consultant.
- .4 The cost of the inspection and guarantee shall be included in the work of this Section.
- .5 If the maintenance bond option is used, provide a letter of consent from a surety licensed to do business in Canada prior to award of the painting contract.

### **PART 2 PRODUCTS**

#### **2.1 Materials**

- .1 Paint, varnish, stain, enamel, lacquer, and fillers used shall be of a type and brand herein specified and listed under "Paint Product Recommendations" as covered in the MPI Architectural Painting Specification Manuals, latest edition, for specific purposes.
- .2 Paint materials such as linseed oil, shellac, turpentine, etc. and any of the above materials not specifically mentioned herein but required for first class work with the finish specified shall be of the highest quality product of an approved manufacturer. All coating material shall be compatible.
- .3 All materials shall be lead, hex. chromium, cadmium and mercury free and shall have low VOC content. No VOC content for paint employed on drywall surfaces.
- .4 Preference should be given to ISO 2002 registered manufacturers.
- .5 Only qualified products with E2 "Environmentally Friendly" rating are acceptable for use on this project. Provide paint products meeting MPI "Environmentally Friendly" E2 ratings based on VOC (EPA Method 24) content levels. Use MPI listed materials having minimum rating where indoor air quality (odour) requirements exist.
- .6 All material shall be premium Architectural grade unless otherwise specified.
- .7 Where required, paints and coatings shall meet the flame spread requirements of local authorities having jurisdiction.

## **2.2 Gloss**

- .1 Paint gloss is defined as the sheen rating of applied paint, in accordance with the following values:
  - .1 Gloss Level 1: Flat or matt: max. 5 units @ 60 degrees to a maximum of 10 units @ 85 degrees.
  - .2 Gloss Level 2: High Sheen Flat (Velvet-like): max. 10 units @ 60 degrees to a maximum of 10 – 35 units @ 85 degrees.
  - .3 Gloss Level 3: Eggshell: max. 10 – 25 units @ 60 degrees to a maximum of 10 – 35 units @ 85 degrees.
  - .4 Gloss Level 4: Satin-like Finish: max. 20 – 35 units @ 60 degrees to a minimum of 35 units @ 85 degrees.
  - .5 Gloss Level 5: Semi-gloss Finish: max. 35 – 70 units @ 60 degrees.
  - .6 Gloss Level 6: Gloss Finish: max. 70 – 85 units @ 60 degrees.
  - .7 Gloss Level 7: High Gloss Finish: more than 85 units @ 60 degrees.

## **PART 3 EXECUTION**

### **3.1 General**

- .1 Method of paint application shall be generally by the accepted trade method. Painting coats specified are intended to cover surfaces satisfactorily when applied in strict accordance with recommendations.
- .2 Apply each coat at the proper consistency. Each coat of paint shall be slightly darker than preceding coat unless otherwise approved.
- .3 Sand lightly between coats to achieve the required finish. Each coat of finish should be dry and hard before a following coat is applied unless the manufacturer's directions state otherwise (4 hours for latex; 8 hours for alkyd).
- .4 Tint filler to match wood when clear finished are specified; work filler well into the grain and before it has set wipe the excess from the surface.
- .5 Application of paint shall be in strict accordance with MPI Architectural Painting Specification Manual requirements.
- .6 Complete hiding is required on all finishes, including deep tone colours.
- .7 Contractor shall employ sufficient tradesmen to carry out the job with no interruption, slow down or inconvenience to the project schedule and operations.

### **3.2 Condition of the Surfaces**

- .1 Prior to commencement of work of this section, thoroughly examine all surfaces scheduled to be painted.
- .2 Report to Consultant any condition adversely affecting this work.
- .3 No painting work shall proceed until all defects have been corrected and surfaces are acceptable for painting.
- .4 Commencement of work shall be held to imply acceptance of surfaces.

- .5 All preparation work shall be the responsibility of this section. (Refer to Surface Preparation).

### **3.3 Preparation of Surfaces**

- .1 Prior to commencement of work of this section, thoroughly examine all surfaces scheduled to be painted. Report to Consultant any conditions adversely affecting this work. Prepare all interior surfaces for repainting in accordance with MPI Manual requirements.
- .2 No painting work shall proceed until all defects have been corrected and surfaces are acceptable for painting. All preparation work shall be the responsibility of this Section.
- .3 Prepare all surfaces in accordance with the requirements in Chapter 3 of the MPI Architectural Painting Specification Manuals (latest edition) and as herein specified.
- .4 Remove and securely store all miscellaneous surface fittings/fastenings (eg: electrical places and frame stops), removable rating/hazard/instruction labels, prior to painting 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 (eg: lacquer finishes).
- .5 All surfaces shall be sanded prior to the application of any coatings.
- .6 Allow full drying between coats, as per manufacturer's recommendations. Sand in between coats.
- .7 Repair all water damaged surfaces and spot prime with a stain blocking primer.
- .8 Surface defects, such as nail/screw popping, paper tears, nicks and scratches, line gauges caused by chair back seat rests, tables, etc., shall be filled, sanded and spot primed with an approved primer and shall be considered normal surface preparation.
- .9 Units severely contaminated with grease, smoke and tar – hand wash with detergent and rinse thoroughly prior to any surface preparation.
- .10 All surfaces: applications shall be by brush/roller, including smooth ceilings.
- .11 Allow full drying between coats, as per manufacturer's recommendations. Sand in between coats.
- .12 Surface defects such as old paint runs on walls and wood works must be sanded smooth prior to the applications of any coating(s).
- .13 Tape fill, sand and spot prime all minor cracks.
- .14 Remove clear tape from walls, ceilings, doors, etc. Remove felt pen graffiti from doors, walls, etc. before priming. Prepare and paint all mechanical and electrical services with the appropriate primers, as per MPI Architectural Specification Manual, latest edition.
- .15 Ensure that a transition primer is applied over alkyd surfaces where waterborne systems have been specified.

### **3.4 Mechanical and Electrical Equipment - General**

- .1 Paint exposed conduits, pipes, hangers and other mechanical and electrical equipment occurring in finished areas. Colour and texture shall match adjacent surfaces, except as noted otherwise.
- .2 Keep sprinkler heads free of paint.
- .3 Paint inside of ductwork where visible with primer and one coat of matt black paint.
- .4 Paint both sides and edges of plywood back-boards for equipment in original finish except for touch-up as required, and paint conduits, mounting accessories and other unfinished items.

### **3.5 Field Quality Control**

- .1 In strict accordance with the MPI Architectural Painting Specifications Manuals requirements.

### **3.6 Painting Schedule**

- .1 The following titles, grades and code numbers refer to those listed in the Master Painters Institute (MPI) Architectural Painting Specifications Manual, latest edition.
- .2 Existing Exterior Systems: (Refer to Chapter 2, MPI Manual)
  - .1 Asphalt Traffic/Zone Marking  
EXT 2.1B alkyd zone/traffic marking
  - .2 Concrete Vertical Surfaces (Premium Grade)  
EXT 3.1A latex finish, (level 2 sheen)
  - .3 Structural Steel & Metal Fabrication (non-galvanized)(Premium Grade)  
EXT 5.1 G (sheen level 5) Pigmented polyurethane over zinc-rich primer and high build epoxy.
  - .4 Galvanized Metals (Premium Grade)  
EXT 5.3G WB light industrial coating, (sheen level 5) (modify by cleaning/etching first with MPI product #25)  
  
Use this finish on exterior galvanized steel, including but not necessarily limited to railings, structural connections, hollow metal doors and frames, ducts, vents, and piping, and other exterior galvanized metal, as indicated and as specified.
- .3 Interior Systems: (Refer to Chapter 3, MPI Architectural Painting Specifications Manual)
  - .1 Concrete Masonry Units (Premium Grade)  
INT 4.2D high performance architectural latex (gloss level 5).
  - .2 Concrete Masonry Units Scheduled as "Epoxy Paint" (Premium Grade)  
(Use this system in Detention Cell area)  
INT 4.2F Epoxy ("Tile-like" Finish)  
(Use INT 4.2G at wet environments).
  - .3 Structural Steel & Metal Fabrications: (Premium Grade)  
INT 5.1R high performance architectural latex (level 5 sheen), (Level 1 at ceilings) over approved shop-applied alkyd metal primer.
  - .4 Galvanized Metal: (Premium Grade)

(Including, but not limited to, hollow metal doors and frames) (level 5 sheen).  
Two finish coats of MPI Product No. 169 water based modified alkyd over  
approved shop-applied galvanized metal prep/primer. (Touch-up shop primer  
after erection, but prior to finish coats).

- .5 Structural Steel & Metal Fabrications (Premium Grade)  
(For use in areas with walls scheduled to receive epoxy paint)  
INT 5.1L Epoxy Finish
- .6 Galvanized Metal (Premium Grade)  
(For use in areas with walls scheduled to receive epoxy paint)  
INT 5.3D Epoxy Paint.
- .7 Dressed Lumber for Painted Finish (Premium Grade)  
INT 6.3A high performance architectural latex (level 5 sheen).
- .8 Millwork Veneered Plywood – Shop-Applied (Lacquer)  
(Shop-applied lacquer finish to millwork and paneling from approved samples)  
Three coat system as follows:
  - .1 First coat: approved lacquer sealer.
  - .2 Sand with 320 grit.
  - .3 Second coat: approved lacquer, 20% sheen.
  - .4 Sand with 320 grit.
  - .5 Third coat: approved lacquer, 20% sheen.
- .9 Painted Wood Millwork – Shop-Applied (Premium Grade)  
INT 6.4B alkyd finish (level 5 sheen).
- .10 Drywall (Premium Grade)  
INT 9.2B high performance architectural latex finish  
Level 1 sheen for ceilings, Level 3 for walls.
- .11 Grilles  
Paint grilles two (2) coats to match walls.
- .12 Door Grilles  
Paint door grilles three (3) coats to match doors.

### **3.7 Mechanical and Electrical Services**

- .1 Paint exposed metalwork, including exposed and insulated piping, sprinkler piping, ductwork, conduit, hangers, etc. in connection with mechanical and electrical trades within finished areas of the buildings, including Mechanical and Electrical Equipment Rooms. Paint as follows:
  - .1 One (1) coat approved metal primer (galvanized primer where applicable) two (2) coats (semi-gloss) in accordance with Clauses 3.6.3.3 and .4.
  - .2 Paint covered and insulated pipes and ducts three (3) coats. One (1) coat PVA sealer; two (2) coats enamel (semi-gloss).
  - .3 Paint inside of ducts behind grilles and registers with one (1) coat flat black paint.

- .4 Colour to match room in which piping or ductwork is exposed, unless otherwise directed or scheduled.
- .5 Keep sprinkler heads free of paint.
- .6 Paint both sides and edges of plywood back-boards for equipment in original finish except for touch-up as required, and paint conduits, mounting accessories and other unfinished items.

### **3.8 Paint Colour Schedule**

- .1 To be issued as a separate document.

### **3.9 Adjust and Clean**

- .1 On completion of the work, remove all paint where spilled, splashed or splattered.
- .2 During the progress of the work, keep the premises free from any unnecessary accumulation of tools, equipment, surplus materials and debris.
- .3 At the conclusion of the work leave the premises neat and clean to the satisfaction of the Consultant.

### **3.10 Field Quality Control**

- .1 Painting surfaces will 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 contamination of paint due to airborne particles.

### **3.11 Protection**

- .1 Protect all newly painted exterior surfaces from rain and snow, condensation, contamination, dust, salt spray and freezing temperatures until paint coatings are completely dry. Curing periods shall exceed the manufacturer's recommended minimum time requirements.
- .2 Erect barriers or screens and post signs to warn of or limit or direct traffic away or around work area as required.

### **3.12 Cleaning**

- .1 Promptly as the work proceeds and on completion of the work, remove all paint where spilled, splashed or spattered using methods that are not detrimental to affected surfaces.
- .2 Keep the premises free from any unnecessary accumulation of tools, equipment, surplus materials and debris.
- .3 Remove combustible rubbish materials 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 (ie. Rags, drop cloths, masking papers) paints, thinners paint removers/strippers in accordance with the safety requirements of authorities having jurisdiction.
- .5 At the conclusion of the work, leave the premises neat and clean.

END OF SECTION



## **PART 1 GENERAL**

### **1.1 Work Included**

- .1 Supply and installation of precast concrete unit pavers to roof deck, including adjustable pedestals, as detailed on the drawings and specified herein.

### **1.2 Related Work**

- .1 Division 03 Cast-in-Place Concrete
- .2 Section 07 52 00 Modified Bituminous Membrane Roofing

### **1.3 Standards**

- .1 Precast concrete pavers and methods of installation shall conform to ASTM C936-96, Standard Specification for Solid Concrete Paving Units, including:
  - .1 Min. compressive strength 8000psi.
  - .2 Max. absorption 5% when tested in accordance with ASTM C140.
  - .3 Resistance of 50 freeze thaw cycles when tested in accordance with ASTM C67 or Can3-A231.2-95 Precast Concrete Pavers, including:
    - .4 Min compressive strength of 7250psi.
    - .5 Resistance of 50 freeze thaw cycles when tested in accordance with Can3-A231.2-M85.

### **1.4 Submittals**

- .1 Submit catalogue and technical data of pavers to Consultant for approval, in compliance with Section 01 33 00.
- .2 Submit test results for compliance of unit paver requirements to CSA (or ASTM) Standards from an independent testing laboratory if requested by the Consultant.

### **1.5 Delivery, Storage and Handling**

- .1 Pavers shall be delivered to and stored at the work site on pallets, metal strapped, or shrink wrapped PVC packaged by the paver manufacturer capable of transfer by fork lift or clamp lift. Unload pavers at job site in such a manner that no damage occurs to the product or the roofing systems.
- .2 Loading on slabs and roofs due to equipment and material, if necessary, shall not exceed the designed live loads.

### **1.6 Quality Assurance/Field Control**

- .1 Installation shall be by an installer with at least 3yrs. Min. experience in placing concrete unit pavers on projects of similar size/scope. The contractor must be prepared to advise of previous work by submission of a written list if requested by Consultant.

## **PART 2 PRODUCTS**

### **2.1 Paver Materials**

- .1 Materials shall conform to the following applicable specifications:
  - .1 Portland Cement: Portland Cement shall conform to the requirements of CSA Standard A5, Portland Cements.
  - .2 Aggregates: Aggregates shall conform to the requirements of CSA Standard A23.1, Concrete Materials and Methods of Concrete Construction, except when a special manufacturing process may require a grading or a material which does not conform to this standard.

- .3 Admixtures: If required to achieve desired colour, an admixture other than an inorganic oxide colour pigment shall conform to the requirements set forth in CSA Standard A23.1.

## **2.2 Unit Pavers**

- .1 24"x24"x2" thick natural colour standard square-edged precast concrete unit pavers equal to "Texada Hydrapressed Slabs" by Abbotsford Concrete Products. Other products having the same characteristics will not be excluded.

## **2.3 Adjustable Pedestals**

- .1 Screwjack type adjustable support pedestals for precast concrete unit pavers made from talc-filled polypropylene copolymer, with head diameter of 5.7" and base diameter of 8".
- .2 Provide complete with slope corrector to compensate for factory-tapered insulation substrate on roof deck.
- .3 Employ proper height range model, including any required coupling, to accommodate total roof slope substrate in order to yield a dead level paver surface.
- .4 Include all required accessories, locking keys and adaptors to produce a complete installation.
- .5 Accepted product: Buzon "Black Jack BC Series" adjustable pedestals.

## **PART 3 EXECUTION**

### **3.1 Inspection**

- .1 Areas of work to receive concrete pavers shall be examined and unsatisfactory conditions reported to the Consultant. Commencement of work shall imply acceptance of conditions.
- .2 Verify that roofing membrane, rigid insulation and protection board are properly installed and ready to receive pedestals and pavers.
- .3 Verify the gradients and elevations of the substrate are correct to allow installation as per the details and meet the intended finished grades. Notify Consultant of any discrepancies prior to proceeding with installation.

### **3.2 Installation of Pedestals and Pavers**

- .1 Install adjustable pedestals directly over SBS protection board "gaskets" supplied by Sectio 07 52 00 on roofing membrane on roof substrate in strict accordance with membrane manufacturer's printed instructions.
- .2 Make adjustments to pedestals to yield a dead level paver surface.
- .3 Take precautions to protect membrane from punctures and damage.
- .4 Place pavers on pedestals in pattern shown. Saw-cut only where necessary. Spaces between pavers shall not exceed 1/8".
- .5 Install pavers dead level.
- .6 Carefully regulate placement procedures to maintain the finished work within the following tolerances:
  - .1 Finished surface of pavers shall be within a tolerance of 1/4" with respect to the designated grade and cross section.
  - .2 Maximum allowable irregularity in the finished surface of pavers shall be 1/4", measured from a 12 foot straight edge.

**3.3 Clean-Up**

- .1 Upon completion of all work leave site in perfect condition. As the work proceeds, remove from the site all debris resulting from the work of this section.
- .2 Protect adjacent surfaces and drains from damage or plugging caused by the work of this section.

**END OF SECTION**



**Project No.: 4056 / 9W740  
Kitsilano Coast Guard Station-  
Building Envelope Rehabilitation  
Vancouver, BC**

APPENDIX B







Building HEROES. Protecting HEROES.

June 26, 2017

Ref: 17-0202 – HMS R2

**Fisheries and Oceans Canada**

1110 - 401 Burrard St  
Vancouver, BC, V6C 3S4

**E-mail:** [Paul.Gatto@dfo-mpo.gc.ca](mailto:Paul.Gatto@dfo-mpo.gc.ca)

**Attention:** Paul Gatto

**Reference:** Targeted, Hazardous Materials Sampling at 1661 Whyte Ave, Vancouver, BC

**Executive Summary**

TSS Total Safety Services, Inc. (Total Safety) has, in accordance with your request, completed lead paint sampling on October 20, 2016, asbestos sampling of the above roof and main floor on January 6, 2017, and asbestos sampling of the main and second floor drywall and windows on June 21, 2017.

The purpose of the asbestos and lead in paint sampling was to identify hazardous materials such as asbestos containing materials, lead containing paints, PCBs, mercury, mould, ozone depleting substances (ODS), silica, rodent/avian feces and/or radioactive sources prior to planned renovations of the exterior of the building, roof, windows and any impacted interior walls. Twenty-six (26) bulk samples of building materials typically suspected to contain asbestos were collected. Four (4) samples of building materials typically suspected to contain lead were collected.

**Asbestos**

Asbestos containing black mastic was identified on the non-date stamped windows of both the first and second floors. In addition, asbestos containing white mastic was identified on the roof vents.

**Lead**

Lead containing paint was found on the dark blue paint on the east stair railing and the light grey/blue paint on the flag pole.

**Silica**

Potential silica-containing building materials such as concrete and drywall were observed.

## **Introduction**

TSS Total Safety Services, Inc. (Total Safety) has in accordance with your request, completed a targeted, hazardous materials assessment of the above referenced location on October 20, 2016, January 6, 2017, and June 21, 2017. The purpose of the surveys was to identify hazardous materials such as asbestos containing materials, lead containing paints, PCBs, mercury, mould, ozone depleting substances (ODS), silica, rodent/avian feces and/or radioactive sources prior to planned renovations of the exterior of the building, roof, windows and any impacted interior walls.

## **Scope of Work**

The scope of these hazardous materials surveys included all areas of the building accessible by non-destructive means that will be impacted upon by upcoming renovation. These areas include the exterior of the building, roofing materials, windows and some interior drywall. Areas such as wall cavities, spaces above fixed ceilings, and sub-layers of flooring were not investigated as the building was occupied and gaining access to these areas would cause significant disturbance.

## **Building Description**

The building is a two level property that was reportedly built after 1991. The interior finishes included drywall walls with concrete floors. The exterior siding was metal panels. The building was occupied at the time of the survey.

## **Methodology**

### **Asbestos Containing Material**

Twenty-six (26) bulk samples of building materials typically suspected of containing asbestos were collected for analysis including drywall and mastic. Sample quantities and type of materials sampled, were selected based on, our professional judgement and experience, the guidelines provided by WorkSafeBC, and their publication "***Safe Work Practices for Handling Asbestos***", (current edition). All of the asbestos bulk samples were analyzed at the in-house laboratory of Total Safety in accordance with the National Institute for Occupational Safety and Health (NIOSH) Analytical Method 9002, "*Asbestos (bulk) by Polarized Light Microscopy.*"

Total Safety laboratories are deemed proficient by the American Industrial Hygiene Association (AIHA) and participate in the quarterly rounds of proficiency testing to maintain registration. All asbestos samples will be stored at our laboratory for a period of one month before being disposed of. Should you wish us to keep these samples for longer please notify us within this period.

### **Lead**

Four (4) representative samples of paint were collected to test for the presence of lead. The samples were submitted in labelled and sealed containers to Maxxam Laboratories for lead analysis using Inductively Coupled Plasma Spectroscopy (ICP) and/or Inductively Coupled Plasma/Mass Spectroscopy (ICP/MS).

## **Findings**

### **Asbestos containing Materials**

WorkSafeBC considers asbestos containing materials as those materials, other than vermiculite, that contain at least 0.5% asbestos by weight. For vermiculite, WorkSafeBC has legislated that vermiculite is asbestos containing if it contains any detectable amount of asbestos.

Table 1 below shows identified asbestos containing building materials. For a complete record of analysis, refer to Appendix A for the Bulk Sample Analysis Report. For photos of asbestos containing materials, refer to Appendix B. For a site plan showing sample locations, see Appendix C. An interpretation of these results is provided in the discussion section.

**Table 1 – Summary of Identified Asbestos Containing Materials**

Sample No.	Sample Date	Location	Material	Asbestos Type (%)	Estimated Quantity
004	Jan 6, 2017	Roof Vents	White Mastic	Chrysotile (2%)	10 In. ft.
010	Jan 6, 2017	All non-date stamped windows	Black Putty	Chrysotile (5%)	250 In. ft.
011	Jan 6, 2017		Black Putty	Chrysotile (5%)	
012	Jan 6, 2017		Black Putty	Chrysotile (5%)	
A6	June 21, 2017		Black Putty	Chrysotile (4%)	
A9	June 21, 2017		Black Putty	Chrysotile (5%)	
A10	June 21, 2017		Black Putty	Chrysotile (5%)	
A12	June 21, 2017		Black Putty	Chrysotile (5%)	
A13	June 21, 2017		Black Putty	Chrysotile (5%)	

### Lead

Sampling results identified two of the collected paint samples to have concentrations above 90µg/g lead (Table 2). The Canada Consumer Products Containing Lead (Contact with Mouth) Regulations defines lead containing paint as paint that contains in excess of 90 mg/kg (µg/g) of lead; this criterion is also recognized by WorkSafeBC. Therefore, these paint samples are lead containing. For a site plan showing sample locations, see Appendix C.

**Table 2 – Summary of Lead in Paint Analysis**

<b>Sample No.</b>	<b>Location</b>	<b>Material</b>	<b>Lead Concentration µg/g</b>
Pb1	Light Grey Blue Paint on North Side of Building	Paint (Light Grey, on Metal)	<6.0
<b>Pb2</b>	<b>Dark Blue Paint on East Railing</b>	<b>Paint (Dark Blue, on Metal)</b>	<b>240</b>
<b>Pb3</b>	<b>Light Grey Blue Paint on Flag Pole</b>	<b>Paint (Light Grey, on Metal)</b>	<b>1280</b>
Pb4	Dark Blue Pain on North Door	Paint (Dark Blue, on Metal)	27.2

### **Mercury**

Mercury thermostats were not observed in the renovation area. Fluorescent light tubes and compact bulbs, which contain mercury, were noted in the building.

### **Ozone Depleting Substances (ODS)**

Refrigerator/freezers, which may contain ozone-depleting substances such as Chlorofluorocarbons (CFCs), were observed in the kitchens.

### **Polychlorinated Biphenyls (PCBs)**

Fluorescent light fixtures, which may contain PCBs in the ballasts, were observed throughout the building.

### **Radioactive Materials**

Smoke detectors, which may contain radioactive materials, were observed throughout the building.

### **Rodent/Avian Feces**

Rodent/avian feces were not observed in the areas surveyed.

### **Mould**

Mould contaminated building materials were not observed in the areas surveyed.

### **Silica**

Silica is present in concrete, and may be present in drywall, all of which were observed in the property.

## **Discussion and Recommendations**

### **Asbestos Containing Materials**

None of the drywall samples were asbestos containing.

One sample of white mastic collected from the roof was found to be asbestos containing, therefore Total Safety concludes that all white mastic used on any part of the exterior surface of the building be treated as asbestos containing.

All samples of black mastic from the non-date stamped windows on both floors were asbestos containing. Total Safety concludes all non-date stamped windows with the black mastic are asbestos containing, unless further testing and analysis is performed.

If any of the identified asbestos containing materials are likely to be disturbed they must be removed by a qualified asbestos abatement contractor prior to any renovation or demolition work being performed, using appropriate work procedures as determined by a Risk Assessment performed by a Qualified Person in accordance with the WorkSafeBC *Occupational Health and Safety Regulation*. In addition to the asbestos-containing materials identified in this non-intrusive survey, there may be additional asbestos containing materials in concealed areas such as wall cavities, ceiling spaces and other inaccessible areas. Should materials suspected of being asbestos containing be discovered, all work should cease at that location until the material has been identified.

The disposal of asbestos containing materials must be performed in compliance with the BC Ministry of Environment; Hazardous Waste Regulations, and will require the site owner to obtain a waste generator (BCG) number.

If any drywall is to be removed, please note that non-asbestos drywall/gypsum is banned from most BC landfills because, when mixed with water, it forms a hazardous gas; however, it is a recyclable product and should therefore not be mixed with other garbage or left attached to other demolition waste. Non-asbestos drywall must be disposed of separately and at a qualified recycling centre.

### **Mercury**

Fluorescent light tubes and bulbs contain mercury vapour and should be disposed of in accordance with BC Ministry of Environment Regulations. Systems are in place that can facilitate recycling of the glass and mercury in fluorescent lights while mitigating worker exposure during the disposal process.

### **Lead**

Lead containing paint was identified on various surfaces within the area surveyed. Based on the laboratory results, Total Safety considers the railings and flagpoles to be coated in lead containing paint. In the event that the surfaces to which lead containing paint has been applied are to be disturbed by cutting, sanding, grinding, burning or otherwise abraded, safe work procedures must be employed in compliance with the requirements of the WorkSafeBC Occupational Health & Safety Regulation Section 6.59-6.69 and their publication ***“Safe Work Practices for Handling Lead”***.

Lead flashings, vents and other lead products can be recycled as metal construction waste.

### **Ozone Depleting Substances (ODS)**

Refrigerator and/or freezer units observed may contain Chlorofluorocarbons (CFCs) and therefore must be disposed of in accordance with the B.C. Ministry of Environment’s *“Ozone-Depleting Substances and Halocarbons Regulations”* (2004). The fridge/freezer must be treated as CFC containing until it has been determined otherwise.

### **Polychlorinated Biphenyls (PCBs)**

Fluorescent light fixtures were observed and may contain PCBs within the light ballasts. Ballasts must be inspected to determine whether or not PCBs are present prior to disposal. Non-PCB containing ballasts must have a label which states they do not contain PCBs. It may also be possible to determine PCB content by using

guidelines in Environment Canada's document, *"Identification of Light Ballasts Containing PCBs"* (EPS 2/CC/2, revised August 1991). If no determination can be made the ballasts must be assumed to contain PCBs. If they are determined to or assumed to contain PCBs they must be disposed of at an approved disposal facility.

### **Radioactive Materials**

Smoke detectors were observed within the areas surveyed. These units may be of the ionization type or photoelectric type. Ionization smoke alarms contain a small amount of a material called Americium 241, which emits alpha particles that collide with the oxygen and nitrogen in the air to create ions. Photo-electric smoke detectors use a tiny beam of light to detect smoke particles. Compared with radioactive detectors that rely on ionized air, photoelectric detectors use no radioactive materials. As long as smoke detectors are used as directed and not opened, stored in large numbers, or damaged, they pose no radiation health risk to humans.

### **Silica**

The disturbance of silica containing materials can result in the production of airborne respirable silica. Crystalline silica dust (e.g., quartz dust) is considered a carcinogen and therefore WorkSafeBC requires that exposures be kept As Low As Reasonably Achievable (ALARA). Workers must be protected from silica dust exposure during construction and demolition projects. In order to control worker exposure to silica dust, a risk assessment and work procedures must be developed, which comply with the requirements contained within the WorkSafeBC Occupational Health & Safety Regulation.

### **WorkSafeBC Regulatory Requirements (Asbestos and Lead):**

Notification in the form of a Notice of Project for Asbestos (NOPA) and/or Notice of Project for Lead (NOPL) must be submitted to WorkSafeBC a minimum of 48 hours prior to commencement of abatement work. In conjunction with the NOPA/NOPL, the contractor must submit a site-specific risk assessment and safe work procedures. In the event that the demolition of the site is proposed, additional sampling will be required to comply with WorkSafeBC OH&S Regulation Part 20: *"Construction, Excavation and Demolition"* specifically Section 20.112 subsections (a), (b), (c) and (d).

To comply with Part 6 of the WorkSafeBC OH&S Regulation, specifically Section 6.32 pertaining to documentation. WorkSafeBC should acquire copies of the abatement contractor's NOPA/NOPL, abatement procedures, any air monitoring results and all documentation submitted to WorkSafeBC. These documents must be maintained for a period of 10 years.

Note that if an abatement contractor is hired to conduct work, they must not list Total Safety as the Consultant on their NOPA/NOPL and abatement procedures unless Total Safety is actually engaged as the Consultant during the abatement phase. If Total Safety is engaged solely as the air monitoring agency, then this distinction must be clearly indicated.

### **Limitations**

This non-intrusive survey did not include hidden materials such as those found in wall cavities or beneath floor finishes.

This report is intended for the exclusive use of Fisheries and Oceans Canada to determine the likely locations of hazardous materials prior to work commencing at the above referenced site. The use of this document for any other purpose is at the sole risk of the user. This report is not a Specification or Scope of Work and the use of this document as such will be at the sole risk of the user.

The contents of this report were based on a site visit conducted by Total Safety personnel. Please note that some hazardous materials may not have been accessible on the day of our survey, and may remain unidentified following our survey. Products containing hazardous materials are sometimes used behind wall partitions or on mechanical systems located in pipe chases or in other concealed areas.

### **Statement of Qualifications**

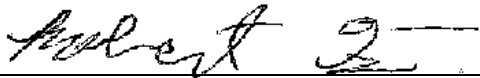
Total Safety has been providing consulting services in the environmental and industrial hygiene fields since 1990. Our personnel include the following:

- Certified Industrial Hygienists (CIH)
- Registered Occupational Hygienist (ROH)
- Canadian Registered Safety Professionals (CRSP)
- Certified Health and Safety Consultants (CHSC)
- Registered Professional Biologist (R.P. Bio)

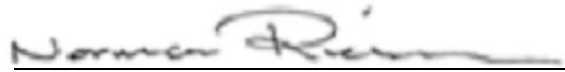
Total Safety also carries Environmental Errors & Omissions Liability Insurance and Comprehensive General Liability Insurance.

Total Safety thanks you for the opportunity to perform this work on your behalf. Should you have any questions or require any additional information, please contact the writer.

Best Regards,



**Robert Tsin, BSc**  
*IH/OHS Consultant*  
Field Investigation and Report



**Norman Richardson, Mech. Eng. Tech., CRSP, CHSC**  
*Technical Operations Manager*  
Report Review

# **Appendix A**

## **Bulk Sample Analysis Report**



## TSS PACIFIC - RECORD OF ANALYSIS

**Report Number:** 200804-56695  
**Client:** Non-Account Client  
**Address:** 1661 Whyte Avenue  
Vancouver BC

**Reference:** Department of Fisheries & Oceans  
**Report Date:** 05-Jan-17  
**Contact:**

Please find enclosed our laboratory's results for the bulk sample(s) submitted to our office for identification.

Sample examination was conducted in accordance with the NIOSH 9002 analytical method using polarized light microscopy and dispersion staining techniques.

A result of 'Asbestos–Not detected' means no asbestos fibres were detected. When asbestos is detected, the minimum quantitation limit is 1%. Levels of asbestos present but below 1% based on visual estimation will be described as TRACE.

This test report relates only to the items tested and any extrapolation by the client of the results is the responsibility of the client. For samples not collected by TSS Pacific, the accuracy of locations and material(s) is the responsibility of the client. Samples will be disposed of after one month, unless we are instructed otherwise.

**If asbestos products are identified in this report they should be remediated safely in accordance with the requirements of Part 6.0 of the Worksafe B.C. Occupational Health and Safety Regulation. In general this will require the completion of a Risk Assessment (Part 6.6.1) completed by a “Qualified Person” as defined in Part 6.1.**



- A result of 'Asbestos–Not detected' means no asbestos fibres were detected;
- When asbestos is detected, the minimum quantitation limit is 1%;
- Levels of asbestos present but below 1% based on visual estimation will be described as TRACE.



# TSS PACIFIC - RECORD OF ANALYSIS

**Report Number: 200804-56695**

**Address: 1661 Whyte Avenue, Vancouver**

**Client Name: Non-Account Client**

**Sampled By: TSS Pacific**

**Reference: Department of Fisheries & Oceans**

**Date Sampled: 03-Jan-17**

**Date Analyzed: 05-Jan-17**

**Analyst: EM**

NO.	SAMPLE INFORMATION	LAYER	ASBESTOS	OTHER MATERIALS
200804-56695-001	Not Specified Exterior / South side Metal panel	Black compound 100%	Not Detected	Non-Fibrous 99%, Synthetic 1%
200804-56695-002	Mastic Roof	Grey compound 100%	Not Detected	Non-Fibrous 99%, Cellulose 1%
200804-56695-003	Mastic Roof	Paint 20% Clear compound 80%	Not Detected Not Detected	Non-Fibrous 100% Non-Fibrous 100%
200804-56695-004	Mastic Roof	White compound 100%	YES - Chrysotile 2%	Non-Fibrous 98%
200804-56695-005	Mastic Roof	Grey compound 100%	Not Detected	Non-Fibrous 100%
200804-56695-006	Roofing Roof / East	Brown fibrous layer 40% Black fibrous tar 20% Paper 5% Gypsum 20% Foam 15%	Not Detected Not Detected Not Detected Not Detected Not Detected	Cellulose 100% Non-Fibrous 80%, Synthetic 10%, Cellulose 5%, Fibreglass 5% Cellulose 100% Non-Fibrous 99%, Cellulose 1% Non-Fibrous 100%
200804-56695-007	Roofing Roof / West	Brown fibrous layer 25% Shiny black tar 5% Tar paper 10% Black fibrous layer 25% Paper 5% Gypsum 20% Foam 10%	Not Detected Not Detected Not Detected Not Detected Not Detected Not Detected Not Detected	Cellulose 100% Non-Fibrous 99%, Cellulose 1% Cellulose 60%, Non-Fibrous 40% Non-Fibrous 80%, Fibreglass 20% Cellulose 100% Non-Fibrous 99%, Cellulose 1% Non-Fibrous 100%



- A result of 'Asbestos-Not detected' means no asbestos fibres were detected;
- When asbestos is detected, the minimum quantitation limit is 1%;
- Levels of asbestos present but below 1% based on visual estimation will be described as TRACE.



# TSS PACIFIC - RECORD OF ANALYSIS

**Report Number: 200804-56695**

**Address: 1661 Whyte Avenue, Vancouver**

**Client Name: Non-Account Client**

**Sampled By: TSS Pacific**

**Reference: Department of Fisheries & Oceans**

**Date Sampled: 03-Jan-17**

**Date Analyzed: 05-Jan-17**

**Analyst: EM**

NO.	SAMPLE INFORMATION	LAYER	ASBESTOS	OTHER MATERIALS
200804-56695-008	Drywall Joint Compound Main floor / Hall	Paint 50% White chalky mix 40% Paper 10%	Not Detected Not Detected Not Detected	Non-Fibrous 100% Non-Fibrous 100% Cellulose 100%
200804-56695-009	Drywall Joint Compound Main floor / Hall	Paint 20% White chalky mix 80%	Not Detected Not Detected	Non-Fibrous 100% Non-Fibrous 99%, Cellulose 1%
200804-56695-010	Putty Main floor / Office North window	Soft black compound 100%	YES - Chrysotile 5%	Non-Fibrous 95%
200804-56695-011	Putty Main floor / Office North window	Soft black compound 100%	YES - Chrysotile 5%	Non-Fibrous 95%
200804-56695-012	Putty Main floor / Storage North window	Soft black compound 100%	YES - Chrysotile 5%	Non-Fibrous 95%
200804-56695-013	Drywall Joint Compound Main floor / Storage North window	White chalky mix 100%	Not Detected	Non-Fibrous 100%

Total Number of Samples: 13

Report Reviewed By: Stephen McIntyre




- A result of 'Asbestos-Not detected' means no asbestos fibres were detected;
- When asbestos is detected, the minimum quantitation limit is 1%;
- Levels of asbestos present but below 1% based on visual estimation will be described as TRACE.



## TSS PACIFIC - RECORD OF ANALYSIS

**Report Number:** 17-0202-60642  
**Client:** Non-Account Client  
**Address:** 1661 Whyte Avenue  
Vancouver BC

**Reference:** Fisheries and Oceans Canada  
**Report Date:** 22-Jun-17  
**Contact:**

Please find enclosed our laboratory's results for the bulk sample(s) submitted to our office for identification.

Sample examination was conducted in accordance with the NIOSH 9002 analytical method using polarized light microscopy and dispersion staining techniques.

A result of 'Asbestos–Not detected' means no asbestos fibres were detected. When asbestos is detected, the minimum quantitation limit is 1%. Levels of asbestos present but below 1% based on visual estimation will be described as TRACE.

This test report relates only to the items tested and any extrapolation by the client of the results is the responsibility of the client. For samples not collected by TSS Pacific, the accuracy of locations and material(s) is the responsibility of the client. Samples will be disposed of after one month, unless we are instructed otherwise.

**If asbestos products are identified in this report they should be remediated safely in accordance with the requirements of Part 6.0 of the Worksafe B.C. Occupational Health and Safety Regulation. In general this will require the completion of a Risk Assessment (Part 6.6.1) completed by a “Qualified Person” as defined in Part 6.1.**



- A result of 'Asbestos–Not detected' means no asbestos fibres were detected;
- When asbestos is detected, the minimum quantitation limit is 1%;
- Levels of asbestos present but below 1% based on visual estimation will be described as TRACE.



# TSS PACIFIC - RECORD OF ANALYSIS

**Report Number: 17-0202-60642**

**Address: 1661 Whyte Avenue, Vancouver**

**Client Name: Non-Account Client**

**Sampled By: TSS Pacific**

**Reference: Fisheries and Oceans Canada**

**Date Sampled: 21-Jun-17**

**Date Analyzed: 22-Jun-17**

**Analyst: EC**

NO.	SAMPLE INFORMATION	LAYER	ASBESTOS	OTHER MATERIALS
17-0202-60642-001	Drywall Joint Compound A1 2nd Floor / Cabin 4 Window side	Paint 20% White chalky mix 80%	Not Detected Not Detected	Non-Fibrous 100% Non-Fibrous 100%
17-0202-60642-002	Drywall Joint Compound A2 2nd Floor / Washroom 1 Exterior wall	Paint 50% White chalky mix 30% Paper 20%	Not Detected Not Detected Not Detected	Non-Fibrous 100% Non-Fibrous 100% Cellulose 100%
17-0202-60642-003	Drywall Joint Compound A3 2nd Floor / Washroom 2 Stall dividing wall	Paint 60% White chalky mix 40%	Not Detected Not Detected	Non-Fibrous 100% Non-Fibrous 100%
17-0202-60642-004	Drywall Joint Compound A4 2nd Floor / Washroom 2 Ceiling above dividing wall	Paint 40% White chalky mix 30% Paper 30%	Not Detected Not Detected Not Detected	Non-Fibrous 100% Non-Fibrous 100% Cellulose 100%
17-0202-60642-005	Drywall Joint Compound A5 2nd Floor / Cabin 2 Window side	Paint 30% White chalky mix 70%	Not Detected Not Detected	Non-Fibrous 100% Non-Fibrous 100%
17-0202-60642-006	Mastic A6 2nd Floor / Cabin 2 Window	Black mastic 100%	YES - Chrysotile 4%	Non-Fibrous 96%



- A result of 'Asbestos–Not detected' means no asbestos fibres were detected;
- When asbestos is detected, the minimum quantitation limit is 1%;
- Levels of asbestos present but below 1% based on visual estimation will be described as TRACE.



# TSS PACIFIC - RECORD OF ANALYSIS

**Report Number: 17-0202-60642**

**Address: 1661 Whyte Avenue, Vancouver**

**Client Name: Non-Account Client**

**Sampled By: TSS Pacific**

**Reference: Fisheries and Oceans Canada**

**Date Sampled: 21-Jun-17**

**Date Analyzed: 22-Jun-17**

**Analyst: EC**

NO.	SAMPLE INFORMATION	LAYER	ASBESTOS	OTHER MATERIALS
17-0202-60642-007	Drywall Joint Compound A7 2nd Floor / Cabin 3 Patio door frame	Paint 20% White chalky mix 80%	Not Detected Not Detected	Non-Fibrous 100% Non-Fibrous 100%
17-0202-60642-008	Drywall Joint Compound A8 2nd Floor / Cabin 1 Window side	Paint 30% White chalky mix 70%	Not Detected Not Detected	Non-Fibrous 100% Non-Fibrous 100%
17-0202-60642-009	Mastic A9 2nd Floor / Cabin 1 Window	Black mastic 100%	YES - Chrysotile 5%	Non-Fibrous 95%
17-0202-60642-010	Mastic 10 2nd Floor / Living room Window	Soft black layer 100%	YES - Chrysotile 5%	Non-Fibrous 95%
17-0202-60642-011	Drywall Joint Compound A11 1st Floor / Officer office Window side	Paint 70% White chalky mix 30%	Not Detected Not Detected	Non-Fibrous 100% Non-Fibrous 100%
17-0202-60642-012	Mastic A12 1st Floor / East kitchen window	Soft black layer 100%	YES - Chrysotile 5%	Non-Fibrous 93%, Cellulose 2%



- A result of 'Asbestos-Not detected' means no asbestos fibres were detected;
- When asbestos is detected, the minimum quantitation limit is 1%;
- Levels of asbestos present but below 1% based on visual estimation will be described as TRACE.



# TSS PACIFIC - RECORD OF ANALYSIS

Report Number: 17-0202-60642

Address: 1661 Whyte Avenue, Vancouver

Client Name: Non-Account Client

Sampled By: TSS Pacific

Reference: Fisheries and Oceans Canada

Date Sampled: 21-Jun-17

Date Analyzed: 22-Jun-17

Analyst: EC

NO.	SAMPLE INFORMATION	LAYER	ASBESTOS	OTHER MATERIALS
17-0202-60642-013	Mastic A13 1st Floor / West kitchen window	Soft black layer 100%	YES - Chrysotile 5%	Non-Fibrous 90%, Cellulose 5%

Total Number of Samples: 13

Report Reviewed By: Stephen McIntyre

*Stephen McIntyre*



- A result of 'Asbestos-Not detected' means no asbestos fibres were detected;
- When asbestos is detected, the minimum quantitation limit is 1%;
- Levels of asbestos present but below 1% based on visual estimation will be described as TRACE.



# **Appendix B**

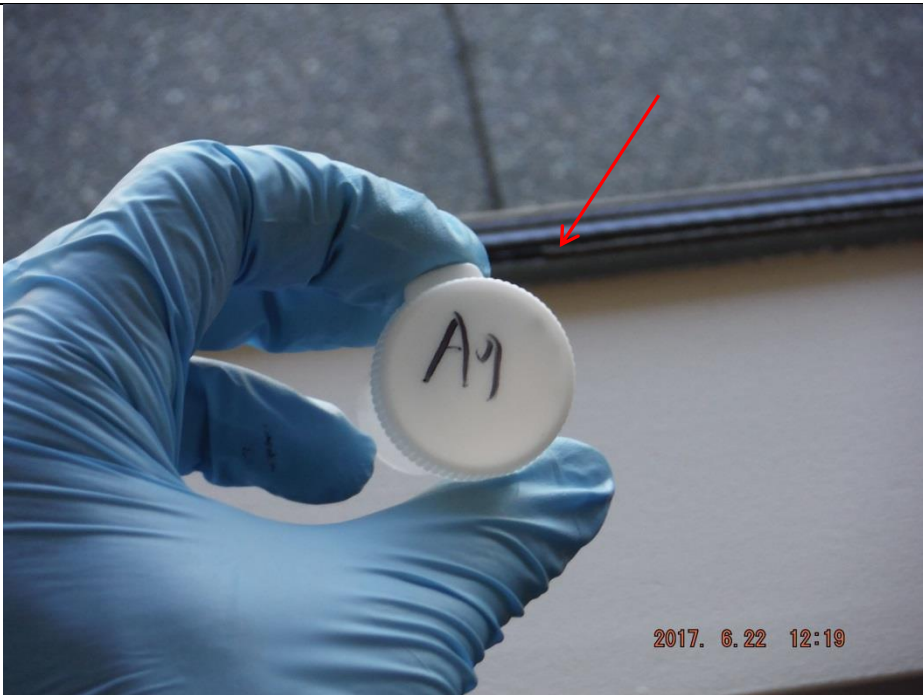
# **Photographs**





**Photo 1** | **Date:** June 21, 2017 | **Location:** 2<sup>nd</sup> Floor- Cabin 2 Window

**Description:** Asbestos-containing black mastic



**Photo 2** | **Date:** June 21, 2017 | **Location:** 2<sup>nd</sup> Floor- Cabin 1 Window

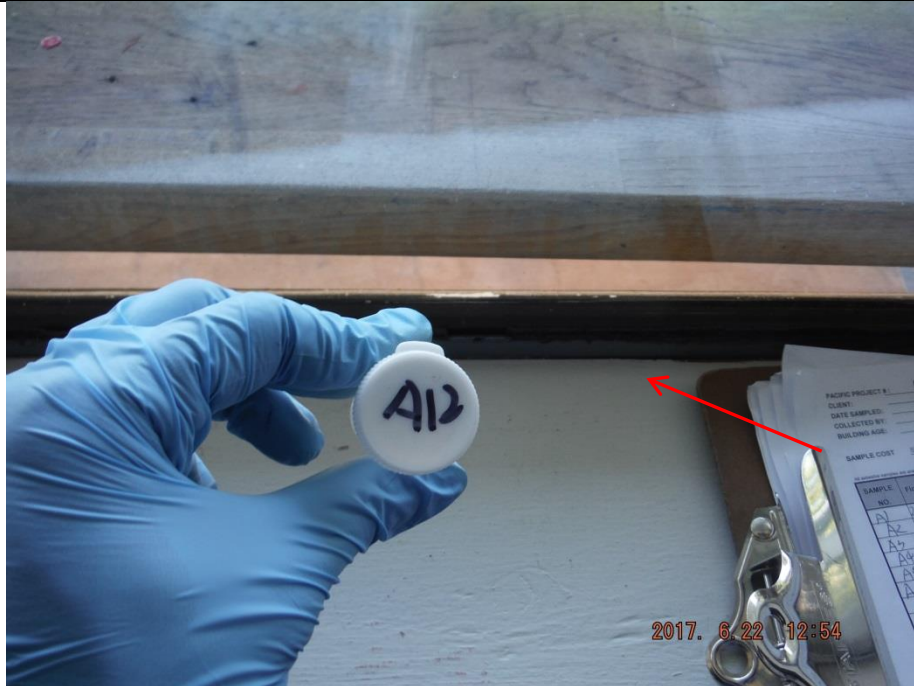
**Description:** Asbestos-containing black mastic



<b>Photo 3</b>	<b>Date:</b> June 21, 2017	<b>Location:</b> 2 <sup>nd</sup> Floor- Cabin 1 Window
<b>Description:</b> Close up photo of asbestos-containing black mastic		

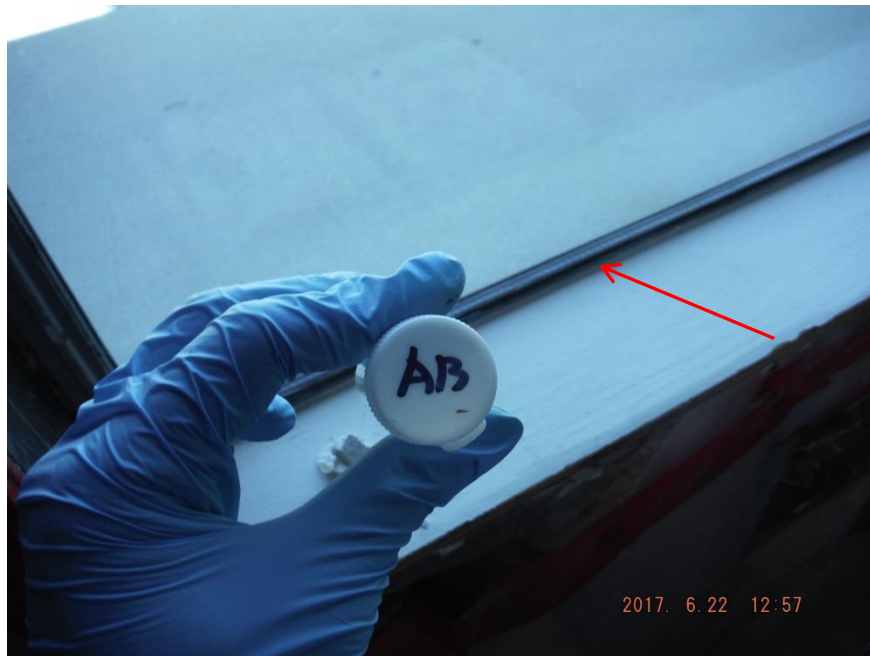


<b>Photo 4</b>	<b>Date:</b> June 21, 2017	<b>Location:</b> 2 <sup>nd</sup> Floor- Living Room
<b>Description:</b> Asbestos-containing black mastic		



**Photo 5** | **Date:** June 21, 2017 | **Location:** 1<sup>st</sup> Floor- East Kitchen Window

**Description:** Asbestos-containing black mastic



**Photo 6** | **Date:** June 21, 2017 | **Location:** 1<sup>st</sup> Floor- West Kitchen Window

**Description:** Asbestos-containing black mastic



<b>Photo 7</b>	<b>Date:</b> June 21, 2017	<b>Location:</b> 1 <sup>st</sup> Floor, East Kitchen
<b>Description:</b> Drywall on the east kitchen was not sampled as it was bolted onto the metal frame and no joint compound was present		



<b>Photo 8</b>	<b>Date:</b> January, 2017	<b>Location:</b> Roof Antenna Pole
<b>Description:</b> White Mastic		



**Photo 9**    **Date:** January, 2017    **Location:** North Window

**Description:** Black Window Putty



**Photo 10**    **Date:** January , 2016    **Location:** NW Office Window

**Description:** Black Window Putty



**Photo 11** | **Date:** January , 2016 | **Location:** NE Window

**Description:** Black Window Putty



**Photo 12** | **Date:** October 2016 | **Location:** East Exterior Stair Railing

**Description:** Pb-2: Dark Blue Paint 240 ug/g



<b>Photo 13</b>	<b>Date:</b> October 2016	<b>Location:</b> Flag Pole
<b>Description:</b> Light Grey Blue Paint: 1280 ug/g		

# **Appendix C**

## **Sampling Locations**



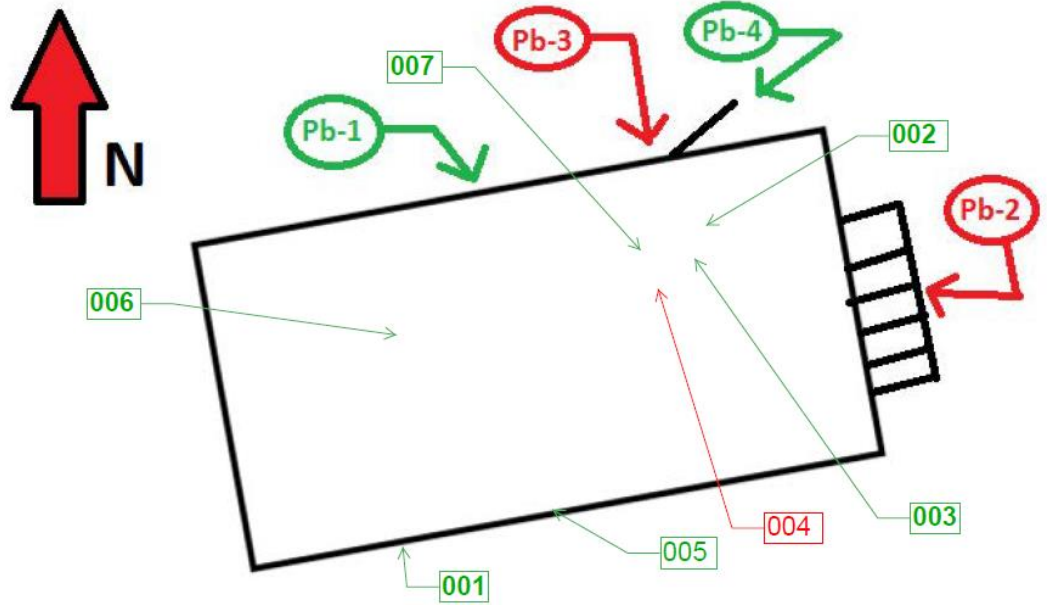
Exterior and Roof

Warning:

In addition to the materials identified in this drawing some hazardous materials may not have been accessible on the day of our survey, and may remain unidentified following our survey.

**Legend:**

- or  = Asbestos Sample Location
- or  = Lead Sample Location



**Client Name: Fisheries and Oceans Canada**

**Site Address: 1661 Whyte Ave Vancouver BC**

**Project No: 17-0202**

**Scale: Not to Scale**

**Drawn By: MF**

**Date: January 2017**



112 - 4595 Canada Way Burnaby, BC V5G 1J9

Phone: 604.292.4700  
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**Main Floor**

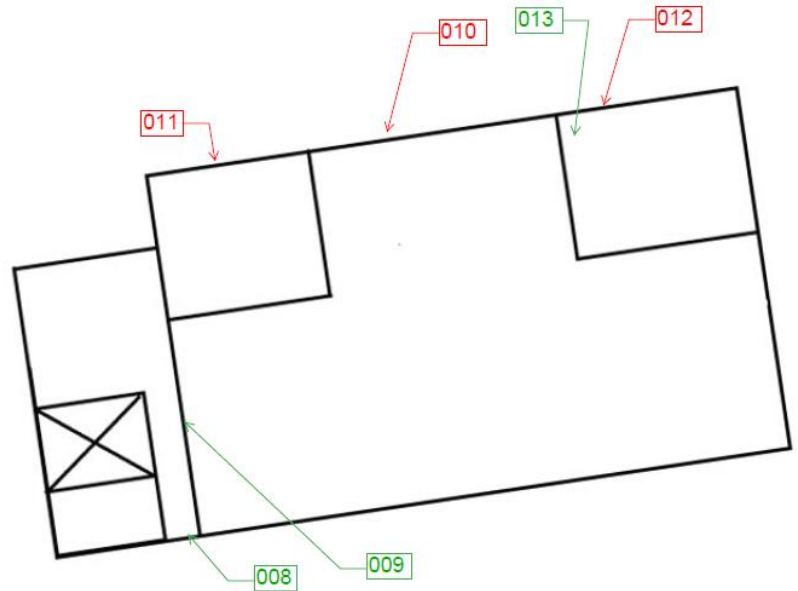
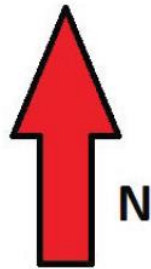
Warning:

In addition to the materials identified in this drawing some hazardous materials may not have been accessible on the day of our survey, and may remain unidentified following our survey.

**Legend:**

 or  = Asbestos Sample Location

 or  = Lead Sample Location



**Client Name: Fisheries and Oceans Canada**

**Site Address: 1661 Whyte Ave Vancouver BC**

**Project No: 17-0202**

**Scale: Not to Scale**

**Drawn By: MF**

**Date: January 2017**



**TOTAL SAFETY**

112 - 4595 Canada Way Burnaby, BC V5G 1J9


Phone: 604.292.4700  
[www.pacificehs.to](http://www.pacificehs.to)  
[talsafety.com](http://talsafety.com)

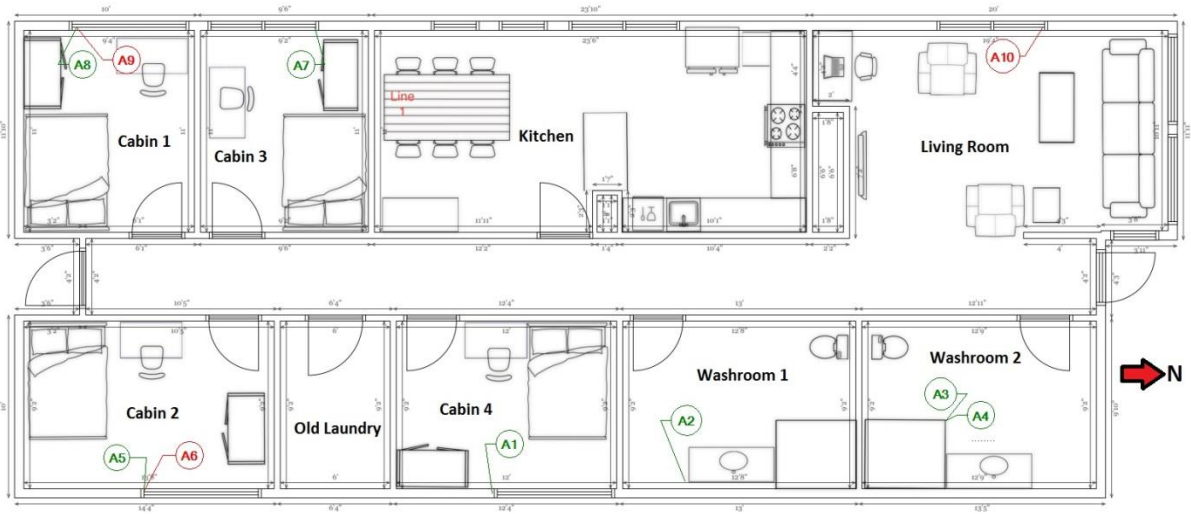
**2<sup>nd</sup> Floor**

**Warning:**

In addition to the materials identified in this drawing, some hazardous materials may not have been accessible on the day of our survey, and may remain unidentified following our survey.

**Legend:**

 or  = Asbestos Sample Location



**Client Name:** Fisheries and Oceans Canada

**Site Address:** 1661 Whyte Ave, Vancouver, BC

**Project No:** 17-0202

**Scale:** Not to Scale

**Drawn By:** RT

**Date:**  
6/22/2017



112 - 4595 Canada Way Burnaby,  
BC V5G 1J9

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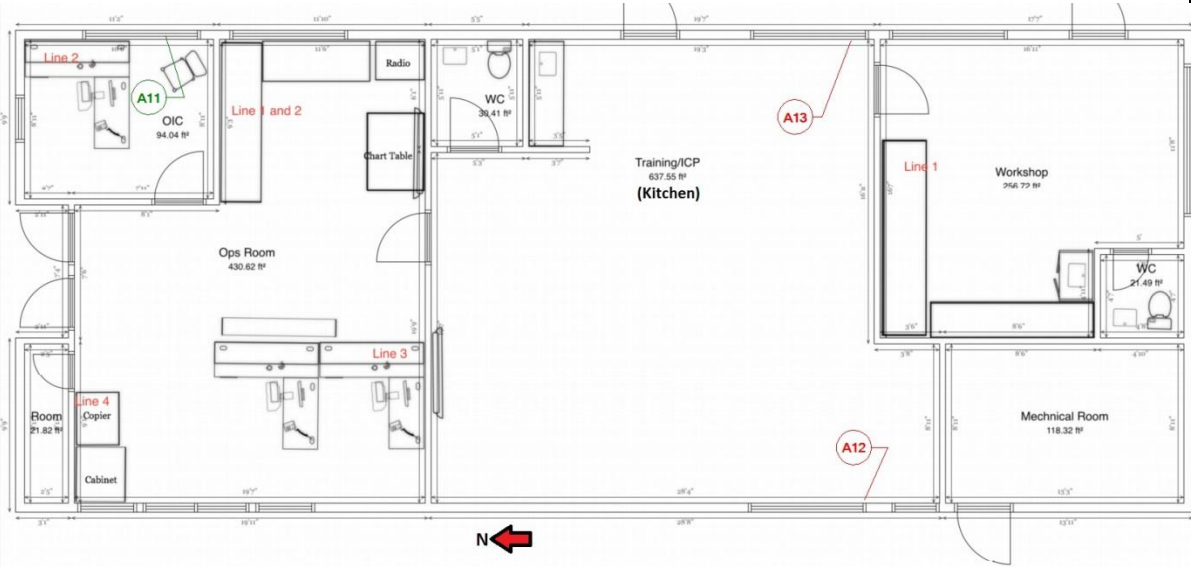
**1<sup>st</sup> Floor**

**Warning:**

In addition to the materials identified in this drawing, some hazardous materials may not have been accessible on the day of our survey, and may remain unidentified following our survey.

**Legend:**

○ or ○ = Asbestos Sample Location



**Client Name:** Fisheries and Oceans Canada

**Site Address:** 1661 Whyte Ave, Vancouver, BC

**Project No:** 17-0202

**Scale:** Not to Scale

**Drawn By:** RT

**Date:** 6/22/2017



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[www.pacificchs.totalsafety.com](http://www.pacificchs.totalsafety.com)



**Project No.: 4056 / 9W740  
Kitsilano Coast Guard Station-  
Building Envelope Rehabilitation  
Vancouver, BC**

APPENDIX C

# Building Enclosure Condition Assessment Report 2015

Kitsilano Coast Guard Station, 1661 Whyte Ave, Vancouver, BC



CLIENT Fisheries and Oceans Canada  
Real Property and Technical Support  
c/o Don Storry  
200 401 Burrard Street  
Vancouver, BC V6C 3S4  
Canada

SUBMITTED BY RDH Building Engineering Ltd.  
224 West 8<sup>th</sup> Avenue  
Vancouver, BC V5Y 1N5  
Canada

REPORT **3456.011**

DATE **May 29, 2015**

R:\3456 - Kitsilano Coast Guard Station\3456.011 - Building Enclosure Condition Assessment\2015  
Report\Kitsilano Coast Guard Station - Condition Assessment Report Update May 2015.doc





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# 1. Introduction

## 1.1. Terms of Reference

In May of 2015, RDH Building Engineering Limited (RDH) was retained by Fisheries and Oceans Canada (FOC) to undertake an assessment of the current condition of the building enclosure at the Kitsilano Coast Guard Station in Vancouver, BC. RDH had previously undertaken a building enclosure condition assessment of the building in 2007 and 2008. The results of this investigation were provided in *Building Enclosure Condition Assessment Report Kitsilano Coast Guard Station, 1661 Whyte Ave, Vancouver, BC*, dated January 17, 2008 and April 9, 2008.

This report, providing the results of the 2015 building enclosure assessment, consists of the original April 9, 2008 report with additional text describing the 2015 findings. New text is distinguished from the original report content as indicated below:

### Report Text

- Original report text from 2008.
- **New observations and recommendations from 2015 assessment.**

New figures in this 2015 report are numbered separately from the original report figures. New figures are numbered sequentially starting with figure 1. Figure captions are in bold text similar to that used for the new 2015 additions to the report text.

Where previous recommendation are still valid, they remain unchanged. Where previous recommendations are no longer valid and are superseded by new recommendations, the previous recommendations remain, but are struck out.

New recommendations are provided in bold text.

Because the recommendations have changed in a number of areas, Section 3 of this report has been modified to reflect a revised scope of rehabilitation work and associated costs.

### Note on Building Orientation

The original 2008 report designations for the building elevation differ from those identified on the original architectural drawings. To avoid confusion, this 2015 update report will use the same designations as the original report. The building's interior stairs are located at the south end of the

building, and the exterior stairs are on the north elevation. The deck is located on the west and north elevations.

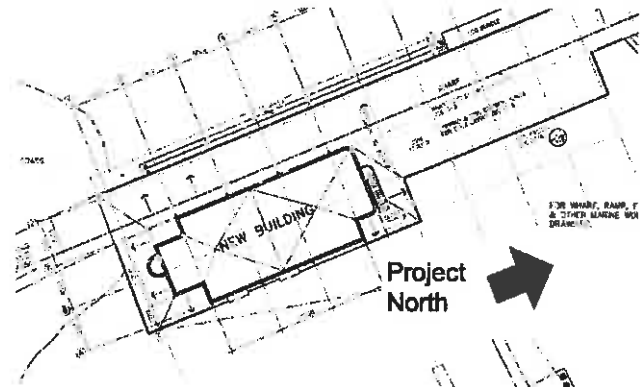


Figure 1 – Building orientation.

RDH Building Engineering Limited (RDH) was retained by Fisheries and Oceans Canada (FOC) to undertake an assessment of the current condition of the building enclosure at the Kitsilano Coast Guard Station in Vancouver, BC.

This report documents the current condition of elements of the building enclosure. It may also provide information related to the specific sources of moisture or other physical factors which have resulted in the observed conditions. This report and the scope of services provided by RDH, does not address mechanical ventilation systems, indoor air quality, mould or the potential health concerns related to the presence of mould. This report is also not intended to provide our opinions regarding the actions or services provided by individuals or organizations that may have contributed to or caused the observed conditions.

Based on the results of the condition assessment, recommendations for rehabilitation and renewal of building enclosure assemblies are provided where appropriate. Further, observations regarding specific maintenance items may be made if they relate to a proposed rehabilitation or renewals recommendation. Renewal items that will be required within the next few years have been included within the rehabilitation plan. However, this report does not constitute an overall maintenance and renewals plan.

## 1.2. Report Organization

Background information relevant to this building and the condition assessment is provided in Section 1 of this report.

The report is organized in accordance with the following five primary elements of the building enclosure as well as interior conditions:

- Walls
- Windows and Doors
- Decks
- Roofs
- At-Grade Assemblies

Section 2 discusses our observations and the implications with respect to current and future building enclosure performance.

Section 3 summarizes the recommendations for rehabilitation and renewals.

Appendix A contains moisture probe and exploratory opening results.

Appendix B is a copy of the RDH letter outlining the results of supplementary investigation performed on Feb 15, 2008 at the Coast Guard Station.

**Appendix C contains moisture probe and exploratory opening results from 2015.**

### 1.3. Documents Provided

The documents provided to RDH are listed in Table 1.2.1 below.

DOCUMENT DESCRIPTION		
1	Architectural Drawings A0-A11	By: Public Works Canada Date: May, 1993

### 1.4. Building Description

The building is a 2-storey structure built on a concrete wharf. The wharf extends to the adjacent shore to provide vehicle access; vehicle parking is provided on the wharf. The building footprint is approximately 190 square meters. The building is clad with prefinished metal panels. The roof is a low-sloped membrane assembly. A deck is provided at the second floor level on the north and west elevations.

A description of the building is provided in Table 1.4.1.



DESCRIPTION	
Name	Kitsilano Coast Guard Base
Address	Vancouver, BC
Date of Construction	1993
Applicable building code	British Columbia Building Code
Building code classification	Part 3
Building envelope requirements	Part 5
Number of storeys	2 storeys
Type of construction	Non-combustible
Principal occupancy	Coast Guard
Other occupancies	None
Structural system	Steel columns and beams with steel stud infill walls

### 1.5. Background

Based on our visit to the building in November, 2007 we understand there has been water ingress associated with the deck above the east and north walls. This water ingress has led to deterioration and mould within the walls. Two large areas of interior gypsum on the ground floor were removed prior to our visit. Mould was found on the interior side of the exterior sheathing at both of these openings. RDH was retained to perform this building enclosure condition assessment to determine the extent to which similar problems exist in other areas of the building and to determine the nature and extent of the required rehabilitation work to address the problems.

### 1.6. Building Enclosure Investigation

Building enclosure investigation involves a number of investigative methods in addition to visual observations. An understanding of this methodology is useful in providing context for this report. The two most common techniques used are moisture probes (measurement of relative moisture content) and exploratory openings (visual review of concealed wall assembly components).

#### 1.6.1. Moisture Content Measurement

Relative moisture content measurement involves checking the moisture levels of the sheathing layer (exterior gypsum) of the exterior walls. Due to the difficulty involved with removing the

aluminum panel cladding system at the Kitsilano Coast Guard Base, we made openings in the interior gypsum to access the wall cavity. A moisture meter is inserted into the interior side of the exterior gypsum sheathing through this opening (fig. 1.6.1.1). The meter uses electrical resistance between two points, a known distance apart, to determine the relative moisture content of the gypsum. Moisture lowers the resistance and is indicated by a higher percentage relative moisture content reading.

Relative moisture content readings of 39% or less are considered to be “normal” in exterior gypsum and are indicative of areas that do not have exposure to moisture or active fungal growth at the time of the investigation (spores may be present but are dormant). Readings between 40% and 59% are indicative of exposure to liquid water, and represent a moisture content range at which fungal growth can be sustained if the fungal spores have germinated. This is interpreted as a “Caution” reading. Moisture content readings over 60% indicate conditions under which fungal spores will germinate, and above 80% supports flourishing growth. Deterioration will progress quickly under such conditions in gypsum that remains at high moisture content. A reading above 60% is interpreted as a “Danger” reading.



Figure 1.6.1.1: Investigation of a typical exterior wall using a moisture meter.

The moisture probing at the Kitsilano Coast Guard Station was carried out during our visit in December. Generally this is a time of year when moisture probe readings are reasonably accurate and representative of the condition of the sheathing during the wetting season. Therefore, we took moisture content readings at most of the exploratory openings.

## 1.6.2. Exploratory Openings

The second technique commonly used in building enclosure investigation is exploratory openings. In this case a portion of the interior gypsum is removed from the wall to allow visual observation of the concealed wall assembly components (fig. 1.6.2.1). The main advantage of exploratory openings is that evidence of moisture ingress in the form of staining, mould or deterioration can be observed even at times when moisture is not present in the wall.



Figure 1.6.2.1: Investigation of exterior wall by means of an interior exploratory opening.

## 2. Review of Building Enclosure Performance

### 2.1. Exterior Walls

This section focuses on the exterior walls, as well as penetrations and interfaces with other assemblies. The exterior walls at the Kitsilano Coast Guard Station are clad with prefinished metal panels. In general over 60% of the exterior walls are fully exposed with no roof overhang protection. There are two portions of the wall with significant overhang protection: the second level walls at the deck on the north and west elevations and the ground level walls along most of the east elevation.

Our recommendations for maintenance, repair or replacement of exterior wall areas are a function of the condition of the cladding (aluminum panels) and underlying components as well as the quality of detailing at interfaces. We also consider wall exposure and how effectively the wall assemblies manage rainwater penetration.

We used the following methods to assess the condition of the exterior walls:

- Visual review of the exterior walls and interfaces with adjacent assemblies from the exterior;
- Exploratory openings through the interior gypsum to document the construction and condition of underlying concealed components such as the sheathing and framing;
- Measurement of the moisture content of the sheathing below various wall interfaces and penetrations;
- A survey of the interior to document signs of moisture ingress and/or condensation related damage.

The original design intent of the metal panel cladding is a “concealed barrier” assembly with respect to rain penetration control. Weepholes are provided at the bottom of aluminum panels at the locations we reviewed. The intent of the weepholes is to drain water that bypasses the exterior surface of the cladding. A sheathing membrane is installed behind the exterior cladding to prevent moisture that penetrates the cladding from damaging moisture sensitive wall components inboard of this layer. Concealed barrier wall assemblies have little tolerance moisture that bypasses the cladding or for

imperfections in the moisture barrier layer and, by today’s standards, are not recommended for exposed walls in the coastal climate of British Columbia.

An uncommon condition was also found in the wall assembly. In a typical concealed barrier wall assembly, the moisture barrier layer (located outboard of the insulation – the cold side) is typically a vapour permeable material to permit drying of the wall assembly. At the Coast Guard Station, there is vapour impermeable self-adhered membrane used as the moisture barrier. It is situated directly behind the aluminum cladding at all locations reviewed. This type of membrane is suitable only in wall assemblies that incorporate the insulation outboard of the exterior sheathing and moisture barrier. This condition appears to occur throughout the building and greatly reduces the drying potential of moisture within the wall assembly, as there is also a polyethylene vapour barrier material present on the interior side of the insulation.

The following list details the typical wall assembly at the Coast Guard Station based on exploratory openings:

EXTERIOR  
Pre-finished aluminum panel cladding  
Self-adhered membrane  
Exterior gypsum sheathing  
Steel studs with fiberglass batt insulation  
Polyethylene vapour barrier  
Interior gypsum

#### INTERIOR

The patterns of sheathing wetting, mould and deterioration indicate that the primary source of moisture causing damage is from rainwater penetration. The extent of increase in damage as a result of the vapour impermeable membrane on the exterior side of the exterior sheathing was not confirmed due to the limited extent of the investigation.

#### Visual Observations

During our field investigation of the exterior walls, we noted various conditions that may impact building enclosure performance, including the following:

- The metal panels rely on perimeter gaskets for water penetration resistance; the perimeter gaskets are generally deteriorated, particularly along the top horizontal edge, and no longer form an effective seal at all locations. The gaskets are also discontinuous at some corners (fig. 2.1.1);

- No drip flashings are provided at the bottom of the wall panels at soffits to drain the concealed barrier cladding system (fig. 2.1.2);
- The base flashing near grade has little to no slope (fig. 2.1.3). The flashing joints on the horizontal are lap joints. There is no membrane on the curb below the base flashing;
- There are many penetrations through the cladding. Many of these penetrations have poor details which increase the risk of water penetration through the cladding:
  - Guardrails are attached with horizontal metal plates that penetrate the cladding. Sealant is installed along part of the horizontal interface of the plate and the cladding; in many locations this sealant is missing, discontinuous or deteriorated (fig. 2.1.4);
  - The structural attachments of the exterior stairs are moderately corroded at the interface with the cladding. No sealant is installed at the cladding interface. There is corrosion at the bottom edge of the cladding panel directly below the stair penetrations (fig. 2.1.5);
  - Several light fixtures are missing sealant at their perimeter (fig. 2.1.6);
  - Sealant is missing or deteriorated at many ventilation, mechanical and electrical penetrations (fig. 2.1.7).



Figure 2.1.2 – No drip flashings provided at base of panels at interface with soffits



Figure 2.1.3 – Base flashing of wall has little or no slope and horizontal lap joints



Figure 2.1.1 – Deteriorated perimeter gaskets at aluminum cladding panels



Figure 2.1.4 – Guardrail support penetration with discontinuous sealant at interface with cladding

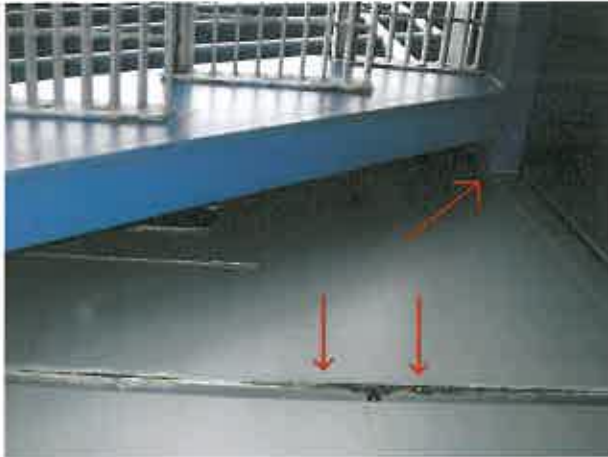


Figure 2.1.5 – Exterior stair structural penetration at cladding and corrosion on bottom of cladding panel directly below penetration



Figure 2.1.6 – Light fixture without perimeter sealant



Figure 2.1.7 – Sealant missing at electrical penetration

## 2015 Visual Observations

Exterior walls of the building were visually reviewed as part of the 2015 investigation. Generally, the condition of the walls were consistent with their age and the materials used. There were no material differences between conditions observed in 2008 and 2015.

## Exploratory Opening Observations and Moisture Probe Results

We visited the site on two occasions to perform exploratory openings. Our original visit was on Dec. 11, 2007. We performed a supplementary investigation on Feb. 15, 2008. In total, 20 exploratory openings were made through the interior gypsum and 2 openings were made by removing ceiling tiles. These openings were made on both floor levels, below various details at the exterior. Two of the openings were made by another party prior to our first visit, and consisted of large areas of gypsum (several stud spaces). Our observations at exploratory openings through exterior walls are summarized in Table 2.1.1. Detailed information regarding the exploratory openings is provided in Appendix A.

Our findings are colour-coded, based on the degree of moisture related staining or deterioration. Green indicates the sheathing and/or framing is sound. Yellow indicates the sheathing and/or framing is moisture stained and/or exhibits minor deterioration. Red indicates the sheathing and/or framing is deteriorated.

Table 2.1.1: Summary of sheathing condition at exploratory openings at exterior walls below various interfaces and details.

Location:	Sound	Moisture stained	Evidence of deterioration, mould or corrosion	Total
Below deck and gutter	9	0	11	11
Below windows	1	0	0	3
Field of wall	1	0	0	1
Field of wall below roof parapet **	1	0	0	5
Total	12	0	11	20

These 5 openings were part of the supplementary investigation performed on Feb 15, 2008. These openings were made in the field of the wall, all within six feet of the top of the parapet.



The sheathing is deteriorated at 11 of 20 (55%) of the exploratory openings reviewed.

Figures 2.1.8 and 2.1.9 illustrate the sheathing staining found at Exploratory Opening No. 1G and No. 8 respectively.



Figure 2.1.8 – Mould and deteriorated exterior sheathing at exploratory opening no: 1G



Figure 2.1.9 – Mould and deteriorated exterior sheathing at exploratory opening no: 8

### 2015 Exploratory Openings

13 additional exploratory openings were made during the 2015 investigation of the building enclosure. Based on the earlier investigation, it has been established that significant water ingress and associated damage had occurred at the ground floor of the west elevation. The 2015 exploratory openings were, therefore, primarily located at the exposed walls at the east elevation and north and south elevations.

A total of 13 openings were made by removing portions of the interior gypsum board. Openings were temporarily repaired;

however, more permanent repairs are required and should be undertaken as soon as possible.

Normal conditions with no indication of exposure to moisture were observed at 11 locations. At 2 openings, evidence of water ingress resulting in damage to substrate materials were observed.

**Exploratory Opening No. 8, 2<sup>nd</sup> Floor East Elevation, F. Crew Room (208)**

Opening No. 8 was located below a passive vent in the exterior wall. Mould was observed on the interior face of the exterior gypsum board sheathing.



Figure 2 – Exploratory opening No. 8. Mould on interior face of paper-faced exterior gypsum board sheathing.



Figure 3 – Exterior condition at location of exploratory opening No. 8.

**Exploratory Opening No. 12, 1<sup>st</sup> Floor South Elevation, Entry (110)**

Opening No. 12 was located below the landing of the interior stairs at the south side of the building. At this location, corrosion was observed on a HSS steel column.



Figure 4 – Exploratory opening No. 12. Corrosion on structural steel column within exterior wall assembly.



Figure 5 – Exterior condition at location of exploratory opening No. 12.

#### Additional Observations

At a number of exploratory openings, brown staining was observed on the interior face of the exterior gypsum board sheathing. It is not clear that the staining is related to water ingress. However, it is possible that the staining results from deterioration and bleed-out of bitumen from the air barrier/water-resistive barrier, self-adhesive membrane on the exterior of the gypsum sheathing. This staining was observed at openings No. 2, 3, 5, and 12.



Figure 6 – Brown staining at interior face of exterior sheathing at exploratory opening No. 12.

Wood liners at a number of passive wall vents below windows were observed to be deteriorated. Deterioration at these locations may result from water ingress directly through the vent, or from water ingress at the window above, or at the interface between the vent flange and adjoining wall cladding.



Figure 7 – Deterioration at wood liner at passive wall vent, north elevation, Room 205, D.I.C.



Figure 8 – Typical passive wall vent penetration of exterior wall.

#### Recommendations

The areas of the walls with significant mould and deterioration are located at the ground floor, below the deck on the north and west elevation. The deck has poor interface details and drains to a concealed gutter. This gutter is positioned directly over the wall below. In addition, the perimeter gaskets of the aluminum cladding panels are generally deteriorated and discontinuous. The pattern and location of the staining and deterioration suggest that water ingress at the top of this ground floor wall is the most significant cause of the damage. Also, the walls in general have a fundamental flaw: the self-adhered membrane installed on the exterior sheathing (outboard of the insulation) is a vapour impermeable material. This condition causes any moisture (vapour or liquid) that enters the wall to remain in the wall assembly. At minimum,

this membrane is accelerating the damage caused by water ingress.

In summary, the walls are deteriorated in many locations. The damage is being accelerated by the impermeable membrane installed outboard of the insulation at all exterior walls. Areas that are not experiencing moisture related problem are at considerable risk due to the wall construction. Therefore, the exterior wall should be rehabilitated with a rainscreen wall assembly and improved detailing at penetrations. Recommendations to improve the deck and gutters are presented in Section 2.3 Decks.

As a cost saving measure, the wall area to be rehabilitated may be reduced to all fully exposed locations. Generally, the current damage is limited to the ground floor wall located below the second floor deck on the north and west elevations. However it should be noted that the incorrect positioning of self-adhered membrane installed outboard of the insulation occurs on all walls. It is therefore possible that the rest of the wall area will require rehabilitation in the future.

RECOMMENDATION	
1A	Rehabilitate all exposed wall areas.
1B	<u>Option:</u> Rehabilitate protected wall areas.

We met with FOC following their initial review of the draft version of this report to discuss alternative options for rehabilitation due to budgeting constraints. We were requested to explore the option of reducing the immediate scope of rehabilitation work.

We performed 5 additional exploratory openings in order to confirm that certain areas could be eliminated from the immediate scope of work. The results of this investigation are detailed in an RDH letter (dated March 3, 2008) – Appendix B. In summary, we found no evidence of significant damage in any walls, except the ground floor walls below the second level deck. Therefore, over the shorter term, localized repairs can be undertaken and further rehabilitation deferred to a later date.

RECOMMENDATION	
1C	<u>Short Term Targeted Repairs Option:</u> Rehabilitate exposed wall areas below second level deck (location of current known damage).

If Option 1C is elected by FOC, ongoing periodic reviews will be required to ensure continued acceptable performance of the walls areas not rehabilitated. If this option is elected, FOC

should budget to rehabilitate the remaining exposed wall areas at some point in the future as damage develops.

#### 2015 Recommendations

The original investigation established that water ingress and associated damage had occurred at the west elevation ground floor walls. The most likely source for this water ingress was the deck and deck to wall interface above the wall, and in particular, the gutter at the edge of the deck.

Concern was expressed with respect to the design of the exterior wall assembly and detailing of wall cladding and interfaces with other assemblies. However, with the exception of the west elevation ground floor level walls, there was not a need for immediate rehabilitation of the building enclosure. Based on the observed deficiencies and experience with other buildings, it was recommended that all exposed walls be rehabilitated.

The results of the 2015 investigation indicate that water ingress is occurring at other exposed wall areas. Evidence of water ingress and deterioration of substrate materials were observed at two locations on exposed walls. Additional evidence of water ingress in the form of deteriorated wood liners at passive vents in exterior walls was observed.

For these reasons and because after 20 years, a number of exterior wall components are approaching the end of their service lives; rehabilitation of all exterior walls is recommended. It is likely that most protected walls on the east, west, and north elevations have not suffered from significant water ingress; and on this basis, could be excluded from the rehabilitation program. However, the protected wall areas are relatively limited and because some work would be required at interfaces with other assemblies (west elevation deck, grade interface on east elevation), the potential cost savings resulting from omission of these walls would be limited. In addition, if protected walls were omitted, windows and doors on the walls would not typically be replaced. If windows were to be replaced any cost savings would be significantly reduced.

2015 RECOMMENDATION	
1	Rehabilitate all exterior wall areas.

## 2.2. Windows and Doors

### 2.2.1. Windows

There are three types of glazed assemblies at the Coast Guard Station: face sealed marine windows (similar in function to punched windows), concealed barrier storefront glazing and face sealed frameless glazing.

The marine windows are located on all elevations, on both levels. The exposure conditions for the marine windows range from fully protected to fully exposed.

The storefront glazing assemblies are located on the east and west walls of the stair landing areas at the south end of the building. The storefront glazing on the west elevation has moderate overhang protection; the storefront glazing on the east elevation is fully exposed.

The frameless glazing is located on the south elevation, around the semi-circular intermediate landing of the south stairs; it is fully exposed.

#### Observations

During our investigation of the windows, we noted various conditions that may impact building enclosure performance, including the following:

- Two of the four storefront glazing assemblies have no overhang protection (fig. 2.2.1.1);
- The storefront glazing frames have no perimeter sealant at the interface with the cladding (fig. 2.2.1.2);
- The storefront glazing head and sill flashings lack end dams (fig. 2.2.1.2);
- The storefront glazing sill flashing has little or no slope;
- The frameless glazing has sealant installed between the base of the glass and the frame; the sealant is weathered (fig. 2.2.1.3);
- The base of the frameless glazing sill has no sealant at the interface with the aluminum fascia panel below; there is moderate localized corrosion at this interface (fig. 2.2.1.4);
- Glazing tape pump out is occurring on the interior of some of the large marine windows.



Figure 2.2.1.1 – Storefront glazing locations with no overhang protection



Figure 2.2.1.2 – Storefront glazing: no perimeter sealant; no end dams on head or sill flashings



Figure 2.2.1.3 – Frameless glazing sealant between glass and sill is weathered but not deteriorated



Figure 2.2.1.4 – Minor corrosion between frameless glazing sill and aluminum fascia panel; no sealant installed at this interface

**Recommendations**

The windows at the Coast Guard Station are generally performing adequately based on the locations reviewed. Despite the fact there is no visible evidence of water ingress around the windows; the storefront glazing assembly on the east elevation is fully exposed. In general, storefront glazing does not perform well in terms of water penetration resistance, at exposed locations. During any wall rehabilitation, the windows situated within the area of rehabilitation will have to be temporarily removed and re-installed. The cost of replacing the storefront glazing at this time may be only slightly higher than saving and re-installing the existing storefront glazing. The overall water penetration resistance of the rehabilitated walls can be enhanced with a glazing system that is more appropriate for the exposure conditions.

The frameless glazing will also have to be removed at the time of any surrounding wall rehabilitation. It is likely that it will have to be replaced to properly fit and interface with the new wall assembly.

The marine windows are not typical in buildings. There may be significant cost associated with replacing these windows. Therefore the option of saving the marine windows and re-installing them should be explored during the design phase of the wall rehabilitation.

RECOMMENDATION	
2	Replace the exposed storefront glazing situated within areas of wall rehabilitation.
3	Replace the frameless glazing situated within areas of wall rehabilitation.

**2.2.2. Doors**

There are four types of door assemblies at the Coast Guard Station: sliding doors, storefront swing doors, solid swing doors and an overhead garage door.

The sliding doors consist of a metal frame around a single large insulated glazing unit. All sliding doors are in protected locations.

The storefront swing door also consists of a metal frame around a single large insulated glazing unit. The storefront swing door is located on the west elevation, near the south end; it has adjacent storefront glazing as side lites and a transom lite. There is moderate overhang protection at this location from the roof overhang two storeys above.

The solid swing doors consist of steel doors and steel frames; there are no panels or glazing within the door leaf. The solid swing doors are located on multiple elevations, in a variety of exposure conditions ranging from protected to fully exposed.

The overhead garage door is located on the north elevation. There is minor overhang protection for this door (approx 8 inches) as it is installed on the interior side of the wall.

**Observations**

During our investigation of the doors, we noted various conditions that may impact building enclosure performance, including the following:

- The storefront swing door has no head flashing (fig. 2.2.2.1);
- Many solid swing doors are fully exposed and are at the same elevation as exterior grade (fig. 2.2.2.2);
- The solid swing door head flashings lack end dams (fig. 2.2.2.3);
- There is no perimeter sealant installed between the door frames and the cladding (fig. 2.2.2.4);
- Some steel doorframes have localized corrosion near grade and the floor on the interior side (figs. 2.2.2.5 and 2.2.2.6);
- The garage door's perimeter gasket has localized mechanical damage.



Figure 2.2.2.1 – Storefront swing door has no head flashing



Figure 2.2.2.4 – No perimeter sealant between steel door frame and adjacent cladding



Figure 2.2.2.2 – Several solid swing doors are fully exposed



Figure 2.2.2.5 – Corrosion of steel door frame near grade



Figure 2.2.2.3 – Head flashings lack end dams



Figure 2.2.2.6 – Corrosion of steel door frame at the interior, near the floor

**Recommendations**

The doors will have to be removed at locations of wall rehabilitation. If the protected wall areas are also rehabilitated (Recommendation 1B), there may be a cost savings realised from saving and re-installing the sliding doors.

The storefront door on the west elevation can be replaced in conjunction with the replacement of other storefront windows. However this door and adjacent glazing is moderately protected. Therefore replacement of this door and adjacent glazing is optional.

The solid swing doorframes have localized corrosion near grade and near the floor on the interior, which indicates some degree of water penetration at the doorsill or jamb. Installing localized canopies above the exposed locations may improve the water penetration performance of these door assemblies. Despite this, the detailing of the doorframe and the position of the door at the same elevation as exterior grade presents a risk that water ingress will still occur to some extent at the sill of the door. The doors and frames may therefore need to be replaced earlier than the adjacent assemblies.

The garage door is performing adequately. There is no current need to replace the garage door.

RECOMMENDATION	
4	Replace the storefront swing door in conjunction with the storefront glazing.
2	Install localized canopies over exposed swing doors.

**2015 Recommendations**

**No significant differences were noted at windows and doors. The recommendations above are still valid. However, a number of additional factors should be considered. Evidence of water ingress at exploratory opening No. 8 suggests that the window above the opening may be leaking. The source of the water ingress at opening No. 12 is likely the glazing to wall interface at the stair window.**

**In addition, after more than 20 years, the glazing assemblies at the building are nearing the end of their useful service lives. Even if there were no problems of water ingress at windows, replacement would likely be required within 5 to 10 years. Evidence of water ingress and the recommendation for rehabilitation of adjoining wall areas suggest that all windows and doors should be replaced in conjunction with the wall rehabilitation work.**

**RECOMMENDATION**

**3 Replace all windows and doors in conjunction with wall rehabilitation.**

**2.3. Decks**

The deck at the Coast Guard Station consists of modified bituminous roofing membrane with foil facer. A second liquid applied membrane is located beneath the roofing membrane, installed over rigid insulation above lower interior space. Concrete pavers are installed on the deck membrane as a traffic surface. It is located at the second level, at the north and west elevations. A metal guardrail is installed around the deck. The guardrail's structural supports are attached through the cladding to the wall, below the level of the deck. A surface drain provides drainage to the north portion of the deck; a concealed gutter provides drainage to the west portion of the deck. The following list details the typical deck assembly at the Coast Guard Station based on architectural drawing no. A-11:

**EXTERIOR**

- Concrete pavers on pads
- Roofing membrane (Sheet applied)
- Roofing membrane (Liquid applied)
- Rigid insulation
- Vapour barrier
- Gypsum sheathing
- Steel decking on steel structure
- Gypsum ceiling

**INTERIOR**

**Observations**

During our investigation of the deck we noted various conditions that may impact building enclosure performance, including the following:

- > The deck membrane is not lapped by the wall cladding or the wall membrane above, which creates an exposed edge of deck membrane; the exposed membrane edge is not adhered to the adjacent concrete slab (fig. 2.3.1);
- > The flashing at the outer edge of the deck has lap joints; no sealant is installed at the lap joints (fig. 2.3.2);
- > The concealed gutter along the west section of the deck is directly above the lower wall assembly (fig. 2.3.3);

→ The membrane has evidence of past leakage. Past repairs were carried out at a location next to the north stairs; a clay substance was observed on the membrane at the repair location (fig. 2.3.4).



Figure 2.3.1 – Deck membrane is not overlapped by cladding or wall membrane above



Figure 2.3.2 – Flashing at outboard edge of deck has lap joints and no sealant at the joints



Figure 2.3.3 – Concealed gutter directly outboard of exterior wall



Figure 2.3.4 – Granular substance on membrane at location of past repair

#### Recommendations

The deck membrane was repaired at two leak locations on July 19 and July 23, 2007; we could not confirm the effectiveness of the repairs. All of the interior openings where significant mould and water damage was observed were at exterior walls located below the deck edge. The gutter is positioned directly over the exterior wall assembly, which create a significantly higher risk of damage from any leakage through the gutter membrane.

Based on the condition of the interior walls below the deck edge, prior membrane repairs and poor interface details, the deck membrane and concealed gutter are contributing to water leakage and related damage. Additionally, the membrane is nearing the end of its service life. Therefore the deck membrane should be replaced. The concealed gutter should be repositioned to be outboard of the exterior wall.



RECOMMENDATION	
4	Replace deck membrane.
5	Relocate concealed gutter outboard of exterior wall.

## 2.4. Roofs

The main roof at the Coast Guard Station consists of an asphalt modified bituminous sheet applied membrane installed in a conventional low-slope roof assembly. A small secondary roof of similar construction is located on the semi-circular building extension at the stairs on the south elevation. The roofs have parapet walls at the perimeter. The following list details the typical roof assembly at the Coast Guard Station based on the architectural drawings no: A-10 and A-11:

### EXTERIOR

Roof membrane  
 Fibreboard  
 Rigid insulation  
 Vapour barrier  
 Gypsum sheathing  
 Steel decking on steel structure  
 Gypsum ceiling

### INTERIOR

### Observations

We made two exploratory openings from the interior by removing suspended ceiling tiles. There was no evidence of water ingress at these two locations.

We performed a visual review of the main roof and observed the following general conditions:

- Drainage is provided at the main roof by two surface drains; drainage is provided at the secondary south roof by two scuppers;
- There was no ponding at the time of our review (there was no rain for the last three days prior to our review);
- Pipe jacks for plumbing vent stacks have pipe caps; the caps lap over the top edge of the inner pipe as expected;
- There are three pedestals on the roof with flashing at their top; the roof membrane extends over the top of these pedestals;
- A satellite receiver dish is installed on one of the three roof pedestals. We could not confirm how the penetrations are sealed (fig. 2.4.1);
- Access to the main roof is provided by roof hatch;
- Five mechanical ventilation units are located on the roof;
- A steel mast is installed near the center of the roof; the base of the mast incorporates a counter flashing with gum-lip sealant joint and a base flashing. We could not confirm where the membrane terminates at the mast.

During our investigation of the roof we noted various conditions that may impact building enclosure performance, including the following:

- The cap flashing does not overlap the wall cladding below. This condition will allow water ingress behind the top wall cladding panels between the gasket and the downturn leg of the cap flashing (fig. 2.4.2);
- The cap flashing has lap joints on the horizontal; sealant at these lap joints is missing or deteriorated. The roof membrane does not lap over the top of the parapet wall. This condition allows water to ingress at flashing lap joints and contact the wood framing at the parapet wall (fig. 2.4.3);
- The cap sheet is backlapped over the cap sheet stripping at all locations including penetrations and parapet walls (fig. 2.4.4);
- The membrane has a blister, approx 12" wide, generally located near the center of the roof (fig. 2.4.5);
- The membrane has significant moss, sea shell and bird droppings on it (fig. 2.4.6);
- The overflow scuppers are backsloped toward the roof. The roof membrane terminates inside the scuppers; this creates an edge of the membrane where water can penetrate any discontinuity in the adhesion of the edge (fig. 2.4.7);
- The cap flashing around the perimeter of the lower secondary roof at the south elevation has lap joints which rely on sealant; the sealant is deteriorated (fig. 2.4.8);
- The interface between the scuppers boxes on the lower secondary roof and the wall cladding relies on sealant; the sealant is deteriorated (fig. 2.4.9);

→ The interface between the cap flashing of the lower secondary roof and the wall cladding relies on sealant; the sealant is deteriorated (fig. 2.4.9).



Figure 2.4.1 – Receiver dish installed on roof pedestal



Figure 2.4.2 – Cap flashing does not overlap wall cladding



Figure 2.4.3 – Cap flashing lap joints have deteriorated or

mission sealant; roof membrane does not extend over the parapet wall



Figure 2.4.4 – Cap sheet is back lapped over cap sheet stripping at all penetrations and parapet walls



Figure 2.4.5 – Air blister in membrane approx 12" wide



Figure 2.4.6 – Significant moss, shells and bird droppings build up on membrane



Figure 2.4.7 – Overflow scupper is backsloped towards roof; roof membrane exposed edge terminates inside scupper



Figure 2.4.8 – Cap flashing of lower secondary roof has lap joints; sealant at joints is missing or deteriorated



Figure 2.4.9 – Sealant at scupper box to cladding interface is deteriorated; sealant at cap flashing to cladding interface is deteriorated

### Recommendations

The main roof and lower secondary roof consist of a sheet-applied membrane, which is approximately ¾ of the way through its useful service life. The sequence of membrane installation is incorrect; the cap sheet is backlapped on all cap sheet stripping areas. In addition, several conditions were identified regarding the parapet wall and cap flashing that could result in water penetration. Therefore, it would be most practical and economical over the longer term to replace the main and lower roof membranes in conjunction with the exterior wall rehabilitation. The deficiencies at the parapet walls would be corrected during the rehabilitation.

However, as a shorter term cost savings measure, roof replacement could be deferred for several years. If roof replacement is deferred, cap flashing inadequacies should be addressed with targeted repairs at the time of exterior wall rehabilitation.

RECOMMENDATION	
6	Replace the main and lower roof membrane.
8B	<del>Option: Defer roof membrane replacement for several years. Perform cap flashing targeted improvements in conjunction with the wall rehabilitation.</del>

### 2015 Recommendations

The condition of the roof membranes are consistent with their age. After 20 years, the SBS membranes are at or nearing the end of their useful service lives. There is no evidence of water ingress into the building interior as a result of roof leaks. For this reason, it is not essential that the roof membranes be replaced immediately. Membrane replacement will likely be required within 2 to 5 years. However, there would be advantages to integrating membrane replacement work with rehabilitation of exterior walls in order to effectively detail interfaces between the assemblies. For this reason, consideration should be given to replacing the roof membranes as part of the wall rehabilitation work.

## 2.5. At-Grade Assemblies

The at-grade assemblies consist of the interface of the concrete dock with the exterior wall of the Coast Guard Station. The concrete dock is supported on piles. The following list details the floor assembly based on architectural drawing 15/A-11:

TOP OF FLOOR

Interior floor finish

Concrete slab  
Rigid insulation  
Vapour barrier (cold applied liquid roofing membrane)  
PRECAST CONCRETE DOCK

The following list details the exterior wall assembly at-grade based on architectural drawing 15/A-11:

**EXTERIOR (At-grade)**

Impregnated Fibreboard (However, we saw cement board)  
Rigid insulation  
Air barrier (self-adhered membrane)  
Concrete curb  
Interior gypsum  
INTERIOR

**Observations**

During our investigation of the at-grade assemblies we noted the following conditions:

- In general, the concrete surface adjacent to the building has a positive slope away from the building;
- The base of wall flashing is not sloped. This flashing utilizes lap joints; no sealant is installed at these joints (figure 2.5.1);
- The fibreboard outboard of the concrete foundation has open joints (figure 2.5.2).



Figure 2.5.1 – Base of wall flashing has little or no slope; joints are lapped and not sealed



Figure 2.5.2 – Cement board joints are open adjacent to grade

**Recommendation**

The base of wall flashing will be replaced in conjunction with the wall rehabilitation. There were no observed or reported problems related to at-grade conditions. There are no recommendations regarding the at-grade assemblies.

**2.6. Interior Conditions**

During our review we made the following general observations regarding the interior conditions of the Coast Guard Station:

- The building is equipped with a sprinkler system;
- Heat and air conditioning are provided by forced air;
- The showers in the washrooms are tile and are positioned on an exterior wall;
- There was no significant evidence of condensation related problems around the interior of the windows and doors;
- There are no operable windows;
- Fresh air vents are located below many windows; the wood trim around the vents is deteriorated in several localized areas (fig. 2.6.1). Several of the deteriorated trims are in locations with no exposure to rain. The deterioration may be caused by a combination of several contributing factors, including the impermeable membrane located below the wood trim.



Figure 2.6.1 – Deteriorated wood trim at fresh air vent

RECOMMENDATION	
7	Replace the deteriorated wood trim at fresh air vents.

### 3. Recommendations

#### 3.1. Summary of Rehabilitation Needs

Our recommendations are based on a combination of factors including: a review of design drawings and other available documentation, information collected at the building through visual observations and exploratory openings, an interview with the property manager, as well as experience and knowledge gained from investigations of many other buildings with similar assemblies and details.

Table 3.1.1 below lists all new 2015 building enclosure rehabilitation and renewal tasks, and tasks that were identified in 2008 that are still valid.

<b>RECOMMENDATION</b>	
<del>1A</del>	<del>Rehabilitate all exposed wall areas.</del>
<del>1B</del>	<del>Option: Rehabilitate protected wall areas.</del>
<del>1C</del>	<del>Short Term Targeted Repairs Option: Rehabilitate exposed wall areas below second level deck (location of current known damage).</del>
<b>1</b>	<b>Rehabilitate all exterior wall areas.</b>
<b>2</b>	Replace the exposed storefront glazing in conjunction with the wall rehabilitation.
<b>3</b>	Replace the frameless glazing in conjunction with the wall rehabilitation.
<b>4</b>	Replace the storefront swing door in conjunction with the storefront glazing.
<b>2</b>	Install localized canopies over exposed swing doors.
<b>3</b>	<b>Replace all windows and doors in conjunction with wall rehabilitation.</b>
<b>4</b>	Replace deck membrane.
<b>5</b>	Relocate concealed gutter outboard of exterior wall.
<b>6</b>	Replace the main and lower roof membrane.
<del>8B</del>	<del>Option: Defer roof membrane replacement for several years. Perform cap flashing targeted improvements in conjunction with the wall rehabilitation.</del>
<b>7</b>	Replace the deteriorated wood trim at fresh air vents.

#### 3.2. Estimated Rehabilitation Project Costs

It is important to understand that the budget construction costs are based on our experience with similar projects; they are presented as probable costs for the program listed in the previous section and are based on approximate unit rates without a complete design developed. A more precise overall figure can only be obtained as the design is undertaken and when contractors actually bid on the project. The construction industry pricing environment can vary significantly, and is dependent to a certain extent on factors external to the actual project. It is possible, depending on the bidding environment, and the level of interest of contractors in the project, that this number could be somewhat reduced. However, Fisheries and Oceans Canada should be aware that rehabilitation costs are currently rising at approximately 10 to 12% per annum. The construction cost estimate does not include project costs such as consultant fees, permits and owner contingencies. Table 3.2.1 includes budget estimates of these costs. For budgeting purposes, an allowance for consulting fees has been assumed. An owner contingency is included in the order of 10% of construction value. An owner contingency is essential in rehabilitation construction to account for costs that may arise in the event of unforeseen damage or issues not directly related to the envelope rehabilitation project.

<b>ITEM</b>	
<b>Order of Magnitude Construction Cost</b>	<b>\$700,000</b>
<b>Consultant Cost</b>	<b>\$120,000</b>
<b>Owner Contingency (allowance 10%)</b>	<b>\$70,000</b>
<b>Landscaping, security, legal (owners discretion)</b>	<b>\$5,000</b>
<b>Permit Fees</b>	<b>\$0</b>
<b>Sub Total</b>	<b>\$895,000</b>
<b>GST (on construction cost and fees)</b>	<b>\$41,000</b>
<b>Total Project Costs</b>	<b>\$936,000</b>

#### 3.3. Next Steps

The condition assessment report presents conceptual level recommendations with respect to rehabilitation and renewal activities. It is important to understand that these

recommendations do not provide a basis for implementing remedial work. Conceptual recommendations need to be developed, refined and documented in detail before the required rehabilitation work can be tendered to contractors.

**RDH Building Engineering Ltd.**

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**Michael Bousfield**  
Field Representative

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**Mike Battistel, ASCT.**  
Senior Building Science Technologist

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**Dave Ricketts, P.Eng**  
Senior Building Science Specialist

2015 Report

  
**Paul Kernan, Architect AIBC**  
Senior Building Science Specialist



  
**Trevor Vlac, B.Tech.**  
Senior Building Science Technologist





# **APPENDIX - A**

## **Moisture Probe And Exploratory Opening Results**



# Appendix A – Moisture Content Survey Methodology and Exploratory Openings

## Moisture Content Methodology

A Delmhorst Model BD-10 analog moisture meter was used, which provides a range of 0 to 100 relative moisture for gypsum products. This instrument uses electrical resistance between two points, a known distance apart, to determine the relative moisture of the material; water lowers the resistance and is indicated by a higher reading. When used on gypsum-based products, readings obtained from the instrument are relative (does not provide an actual % moisture content), and are intended for comparison to other areas and to known results. Because the readings are relative moisture contents and not true moisture contents, they are referred to as "RM%."

### Exterior Gypsum Sheathing

Based on preliminary testing conducted by RDH, mould and mildew growth may occur on the surface of Exterior Gypsum sheathing when an RM% of approximately 40 or higher is obtained. RM% values of 39% or less will be obtained when the relative humidity adjacent to the Exterior Gypsum Board is 75% or less. Typically, the relative humidity in the wall cavity of an exterior wall under normal operating conditions is below 75% except during cold winter exterior conditions. Generally, relative moisture contents of 59% in Exterior Gypsum board indicate a high probability of contact with liquid moisture. In many wall assembly types, relative humidity levels of 75% to 100% at the location of the exterior wall sheathing are not uncommon; especially in winter months. Therefore, relative moisture content readings of Exterior Gypsum Board between 40% and 59% and are not necessarily indicative of contact with liquid moisture.

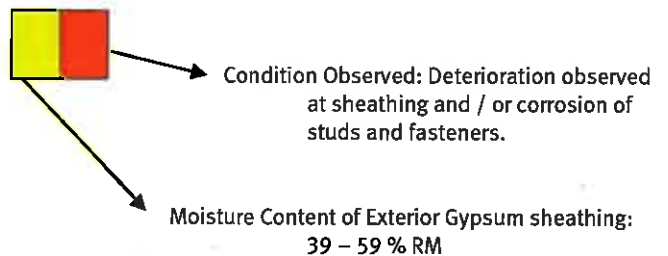
Exterior Gypsum Board – Relative Moisture (%)
<39% Normal Range (RH<75%)
40 to 59% Caution (RH 75% to 100% possible growth of mould at some established colonies)
>59% Danger (Exposure to liquid water, mould growth likely)

## Exploratory Opening Methodology

Several exploratory openings were made into the exterior assemblies to confirm conditions of hidden components and materials within the assemblies. The photos taken at each of the exploratory openings is located at the end of this Appendix.

Legend		
Moisture Content		Observations
EGB = 0 - 39		Sheathing, framing and fasteners observed to be in sound condition
EGB = 39 - 59		Moisture staining and/or minor damage observed at sheathing and / or minor corrosion of framing
EGB = >59		Deterioration observed at sheathing and / or corrosion of framing and fasteners
No moisture content reading was made	X	Indicates that no observation was made

Example exploratory opening location:



### Exploratory Openings

Detailed observations at exploratory openings performed during our original visit on Dec. 11, 2007 are provided in Table A-1.

To provide an optional reduced scope of immediate rehabilitation, RDH performed supplementary investigation to identify wall areas that could be deferred. 5 additional interior openings were made at walls locations close to the roof parapet. Detailed observations at these exploratory openings performed on Feb. 15, 2008 are provided in Table A-2.

**Table A1 – Detailed Observations at Exploratory Openings**








Exploratory Opening No.	Elevation	Location	Colour code	Cladding Type	Opening Type	Type	Substrate Condition		Photo Reference	Comments
							Moisture Stained?	Deteriorated?		
1 Stud space A	West	Ground floor, exercise room. Existing, large opening through interior gypsum.		Preformed Metal Panels	Interior gypsum removed	Gypsum	Yes	Yes	A-01A-01 A-01A-02 A-01A-03 A-01A-04	Localized, significant mould growth at base of wall. Exterior fasteners corroded. Minor corrosion of steel stud track.
							Yes	Yes	A-01B-01 A-01B-02 A-01B-03	Same as above (1A).
							Yes	Yes	A-01C-01 A-01C-02 A-01C-03	Mould at base of wall. Steel stud track and fasteners are corroded.
							Yes	Yes	A-01D-01 A-01D-02 A-01D-03	Significant mould and deterioration at base of wall. Steel stud track and fasteners are corroded.
1 Stud space B	West	Each opening at this location (1A to 1G) was approx 3 ft high and one stud space wide.		Preformed Metal Panels	Interior gypsum removed	Gypsum	Yes	Yes	A-01E-01 A-01E-02 A-01E-03	Significant mould and deterioration throughout most of opening area. Steel stud track and fasteners are corroded.
							Yes	Yes	A-01F-01 A-01F-02 A-01F-03	Same as above (1E).
							Yes	Yes	A-01G-01 A-01G-02 A-01G-03 A-01G-04	Same as above (1E). Self adhered membrane outboard of exterior gypsum.
							Yes	Yes		
1 Stud space C	West	Photo Reference A-01-00		Preformed Metal Panels	Interior gypsum removed	Gypsum	Yes	Yes		
							Yes	Yes		
							Yes	Yes		
							Yes	Yes		
1 Stud space D	West	Photo Reference A-01-00		Preformed Metal Panels	Interior gypsum removed	Gypsum	Yes	Yes		
							Yes	Yes		
							Yes	Yes		
							Yes	Yes		
1 Stud space E	West	Photo Reference A-01-00		Preformed Metal Panels	Interior gypsum removed	Gypsum	Yes	Yes		
							Yes	Yes		
							Yes	Yes		
							Yes	Yes		
1 Stud space F	West	Photo Reference A-01-00		Preformed Metal Panels	Interior gypsum removed	Gypsum	Yes	Yes		
							Yes	Yes		
							Yes	Yes		
							Yes	Yes		
1 Stud space G	West	Photo Reference A-01-00		Preformed Metal Panels	Interior gypsum removed	Gypsum	Yes	Yes		
							Yes	Yes		
							Yes	Yes		
							Yes	Yes		

Table A1 – Detailed Observations at Exploratory Openings










Exploratory Opening No.	Elevation	Location	Colour code	Cladding Type	Opening Type	Type	Substrate Condition		Photo Reference	Comments
							Moisture Stained?	Deteriorated?		
								Relative Moisture Content (%)		
2	North	Ground floor, north washroom.		Preformed Metal Panels	Interior gypsum removed	Gypsum	Yes	Yes, extensively	A-02-01 A-02-02 A-02-03 A-02-04 A-02-05 A-02-06 A-02-07 A-02-08	Significant, extensive mould on all exterior gypsum. Gypsum is deteriorated. Steel stud track and fasteners are corroded. Minor corrosion on the steel column. Self adhered membrane outboard of exterior gypsum.
		Existing, large opening through interior gypsum (all interior gypsum on exterior wall removed).					No	No reading taken		
3	West	Ground floor, locker room: Interior wood trim at air vent.		Preformed Metal Panels	Removed portion of deteriorated wood	Gypsum	Yes	Yes	A-03-01 A-03-02 A-03-03	Wood trim around vent is deteriorated. Self-adhered membrane wrapped over wood in rough opening.
							No	40 %		
4	North	Second floor, northwest office: Below window.		Preformed Metal Panels	Interior gypsum removed	Gypsum	No	No	A-04-01 A-04-02 A-04-03 A-04-04	Self adhered membrane outboard of exterior gypsum. Wood trim around vent is moderately deteriorated; unlike vent at exp opening 3 (exposed location), this location has 6' overhang protection.
							No	40 %		
5	East	Second floor, men's washroom: Below counter.		Preformed Metal Panels	Interior gypsum removed	Gypsum	No	No	A-05-01 A-05-02	No evidence of water ingress.
							No	40 %		
6	West	Second floor, galley: Base of wall between window and sliding door.		Preformed Metal Panels	Interior gypsum removed	Gypsum	No	No	A-06-01 A-06-02 A-06-03	Self adhered membrane outboard of exterior gypsum.
							No	40 %		

Table A1 – Detailed Observations at Exploratory Openings

Exploratory Opening No	Elevation	Location	Colour code	Cladding Type	Opening Type	Substrate Condition		Photo Reference	Comments		
						Type	Moisture Stained?			Defeteriorated?	Relative Moisture Content (%)
7	West	Second floor, coxswain quarters: Below window.		Preformed Metal Panels	Interior gypsum removed	Gypsum	No	No	35 %	A-07-01 A-07-02 A-07-03	Wood trim at adjacent vent has localized deterioration.
8	West	Ground floor, operations office: Base of wall between windows.		Preformed Metal Panels	Interior gypsum removed	Gypsum	Yes	Yes, extensively	100 %	A-08-01 A-08-02 A-08-03	Significant mould and deterioration throughout all of opening area. Steel stud track and fasteners are corroded.
9	N/A	Galley – second floor, close to west elevation		SBS low-slope roofing	Lifted interior ceiling tile	Steel Decking	No	No	No reading taken	A-09-01 A-09-02	No evidence of water ingress. Roof structural system: Steel deck on steel joists
10	N/A	Hallway, outside galley – second floor central corridor		SBS low-slope roofing	Lifted interior ceiling tile	Steel Decking	No	No	No reading taken	A-10-01	No evidence of water ingress.

**Table A2 – Detailed Observations at Exploratory Openings (Supplementary Investigation)**

Exploratory Opening No.	Elevation	Location	Colour code	Cladding Type	Opening Type	Substrate Condition			Photo Reference	Comments	
						Type	Moisture Stained?	Deteriorated?			Relative Moisture Content (%)
11	North	Women's bathroom, through ceiling at northeast corner	<input checked="" type="checkbox"/>	Preformed Metal Panels	Interior gypsum removed	Gypsum	No	No	No reading taken	A-11-01 A-11-02 A-11-03	No evidence of water ingress.
12	East	Women's bathroom, through ceiling at northeast corner	<input checked="" type="checkbox"/>	Preformed Metal Panels	Interior gypsum removed	Gypsum	No	No	No reading taken	A-12-01 A-12-02 A-12-03	No evidence of water ingress.
13	East	Hallway, second floor landing outside elevator	<input checked="" type="checkbox"/>	Preformed Metal Panels	Interior gypsum removed	Gypsum	No	No	No reading taken	A-13-01 A-13-02 A-13-03	No evidence of water ingress.
14	East	Bedroom, center of east elevation	<input checked="" type="checkbox"/>	Preformed Metal Panels	Interior gypsum removed	Gypsum	No	No	No reading taken	A-14-01 A-14-02 A-14-03	No evidence of water ingress.
15	West	Galley, above suspended ceiling level	<input checked="" type="checkbox"/>	Preformed Metal Panels	Interior gypsum removed	Gypsum	No	No	No reading taken	A-15-01 A-15-02 A-15-03	No evidence of water ingress.





3456.00 - KITSILANO SAR STATION



A-01-00



A-01A-01



A-01A-02



A-01A-03



A-01A-04



A-01B-01

3456.00 - KITSILANO SAR STATION



A-01B-02



A-01B-03



A-01C-01



A-01C-02



A-01C-03



A-01D-01

**3456.00 - KITSILANO SAR STATION**



**A-01D-02**



**A-01D-03**



**A-01E-01**



**A-01E-02**



**A-01E-03**



**A-01F-01**

**3456.00 - KITSILANO SAR STATION**



**A-01F-02**



**A-01F-03**



**A-01G-01**



**A-01G-02**



**A-01G-03**



**A-01G-04**

3456.00 - KITSILANO SAR STATION



A-02-01



A-02-02



A-02-03



A-02-04



A-02-05



A-02-06

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A-02-07



A-02-08



A-03-01



A-03-02



A-03-03



A-04-01

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A-04-02



A-04-03



A-04-04



A-05-01



A-05-02



A-06-01

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**A-06-02**



**A-06-03**



**A-07-01**



**A-07-02**



**A-07-03**



**A-08-01**



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A-08-02



A-08-03



A-09-01



A-09-02



A-10-01



A-11-01

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A-11-02



A-11-03



A-12-01



A-12-02



A-12-03



A-13-01

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A-13-02



A-13-03



A-14-01



A-14-02



A-14-03



A-15-01

**3456.00 - KITSILANO SAR STATION**



**A-15-02**



**A-15-03**

# **APPENDIX - B**

**Additional Investigation Of Kitsilano Coast Guard Base**



TO **Don Storry**  
Fisheries and Oceans Canada  
200 401 Burrard Street  
Vancouver, BC V6C 3S4

EMAIL [storryd@pac.dfo-mpo.gc.ca](mailto:storryd@pac.dfo-mpo.gc.ca)

**3456.00**  
**Kitsilano Coast Guard Station**

**03 March 2008**

REGARDING **Additional Investigation of Kitsilano Coast Guard Station**

Dear Don,

We are writing to summarize our findings from our supplemental investigation of the exterior walls below roof parapets at the Kitsilano Coast Guard Station.

RDH performed a building condition assessment of the Coast Guard Station, documented in the RDH report dated January 17, 2008. The report identified moisture damage, mould and deterioration in the exterior walls, primarily located below the second storey deck. In addition, we confirmed that the wall assembly is constructed with a vapour impermeable membrane installed outboard of the insulation. This condition eliminates drying potential and makes this wall assembly extremely moisture sensitive. Therefore, we recommended that all exposed wall areas be rehabilitated.

Due to budget concerns, the Department of Oceans & Fisheries requested that RDH explore the possibility of reducing the immediate scope of work to a targeted rehabilitation of only areas with current widespread deterioration. Rehabilitation of the other exposed areas would be deferred until future moisture damage prompts full rehabilitation. There are several sections of exposed wall, including those directly below the roof parapet walls, which required additional investigation in order to determine which areas could be deferred from the immediate reduced scope of work.

RDH visited the Coast Guard Station on February 15, 2008 to perform additional investigation for the purpose of eliminating several wall sections from the targeted rehabilitation scope of work. We performed a total of five openings through the interior gypsum, all approximately six feet or less below the roof parapet. In summary, we observed no deterioration on the backside of the exterior sheathing at all five locations. Table 1 contains detailed observations of the interior openings.

The finding of no damage suggests that widespread deterioration is unlikely in these areas at this time. However, as noted previously all the exterior walls are constructed with a fundamental flaw: there is a vapour impermeable membrane installed outboard of the insulation (further discussed in the RDH report dated January 17, 2008). Any water penetration into the wall assembly is likely to result in moisture damage similar to that observed in the ground floor wall below the deck.

Based on the current lack of damage it is possible to defer rehabilitation of significant portions of the exterior wall area. For wall areas deferred, periodic review is required to confirm ongoing acceptable performance. The Department of Oceans and Fisheries should plan for rehabilitation of these deferred wall areas within the next five years.

The current rehabilitation program should generally include the following elements:

- › Exterior wall areas that are currently damaged: Ground floor walls below deck on north and west elevations.
- › The second level deck, associated drainage system and guardrail.
- › The cap flashing on the roof parapet wall.

The project cost estimate for this rehabilitation program is detailed in table 2 below:

Table 2 Order of Magnitude Rehabilitation Costs,  
Reduced Scope

ITEM	
Order of Magnitude Construction Cost	\$285,000
Consultant Cost	\$45,000
Owner Contingency (allowance 10%)	\$40,000
Landscaping, security, legal (owners discretion)	\$5,000
Permit Fees	\$Unknown
Sub Total	\$375,000
GST (on construction cost and fees)	\$17,000
<b>Total Project Costs</b>	<b>\$392,000</b>

We trust that this is the information you require. Please do not hesitate to contact us should you require clarification of any aspect of this report.

Yours truly,

**RDH Building Engineering Ltd.**

Michael Bousfield,  
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mbousfield@rdhbe.com

cc Dave Ricketts, RDH Building Engineering Ltd.  
Mike Battistel, RDH Building Engineering Ltd.

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**Table 1**

Location 1  
North elevation, NE corner

Exterior view of opening area



Interior overall



Interior opening



Location 2  
East elevation, NE corner



Location 3  
East elevation, SE corner



Location 4  
East elevation, center



Location 5  
West elevation, center of protected wall area at deck














# Appendix C




## 2015 Moisture Probe and Exploratory Opening Results



Table A3 – Detailed Observations at Exploratory Openings (2015 Assessment)

Exploratory Opening No.	Elevation	Location	Colour code	Cladding Type	Opening Type	Type	Substrate Condition		Photo Reference	Comments
							Moisture Stained?	Deteriorated?		
		Relative Moisture Content (%)								
2015-01	East	Second floor, Lockers/W.C. Room 206		Preformed Metal Panels	Interior gypsum removed	Gypsum	No	No	2015-01	No evidence of water ingress.
2015-02	East	Second floor, F. Crew Room 208		Preformed Metal Panels	Interior gypsum removed	Gypsum	No	No	2015-02	Brown staining.
2015-03	West	Second floor, northwest office, (O.I.C.) Room 205		Preformed Metal Panels	Interior gypsum removed	Gypsum	No	No	2015-03	Brown staining.
2015-04	North	Second floor, northwest office, (O.I.C.), Room 205		Preformed Metal Panels	Interior gypsum removed	Gypsum	No	No	2015-04	No evidence of water ingress.
2015-05	East	Second floor, northwest office, (O.I.C.), Room 205		Preformed Metal Panels	Interior gypsum removed	Gypsum	No	No	2015-05	Brown staining.
2015-06	North	Second floor, Lockers/W.C. Room 206		Preformed Metal Panels	Interior gypsum removed	Gypsum	No	No	2015-06	No evidence of water ingress.
2015-07	East	Second floor, Lockers/W.C. Room 207		Preformed Metal Panels	Interior gypsum removed	Gypsum	No	No	2015-07	No evidence of water ingress.
2015-08	East	Second floor, F. Crew Room 208	X	Preformed Metal Panels	Interior gypsum removed	Gypsum	Yes	Yes	2015-08	Mould on interior face of exterior sheathing.
2015-09	East	Second floor, M. Crew Room 209		Preformed Metal Panels	Interior gypsum removed	Gypsum	No	No	2015-09	No evidence of water ingress.
2015-10	East	Second floor, M. Crew Room 209		Preformed Metal Panels	Interior gypsum removed	Gypsum	No	No	2015-10	No evidence of water ingress.

**Table A3 – Detailed Observations at Exploratory Openings (2015 Assessment)**

Exploratory Opening No.	Elevation	Location	Colour code	Cladding Type	Opening Type	Substrate Condition			Photo Reference	Comments	
						Type	Moisture Stained?	Deteriorated?			Relative Moisture Content (%)
2015-11	East	Second floor, M. Crew Room 209		Preformed Metal Panels	Interior gypsum removed	Gypsum	No	No	10%	2015-11	No evidence of water ingress.
2015-12	South	Stair Landing, east side		Preformed Metal Panels	Interior gypsum removed	Gypsum	Yes	Yes	No reading taken	2015-12	Corrosion on structural steel, brown staining on sheathing
2015-13	West	Second floor, Lounge/Meeting Room 201		Preformed Metal Panels	Interior gypsum removed	Gypsum	No	No	40%	2015-13	No evidence of water ingress.

Exploratory  
Opening  
Number

Exterior View of Opening Area

Interior Overall View

Interior Opening View

2015-01



2015-02



2015-03



2015-04



2015-05



2015-06



2015-07



2015-08



2015-09



2015-10



2015-11





2015-12



2015-13







**Project No.: 4056 / 9W740  
Kitsilano Coast Guard Station-  
Building Envelope Rehabilitation  
Vancouver, BC**

APPENDIX D





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*Note 1: The materials, finishes and colours listed herein are to be provided as part of, and supplementary to the corresponding Specification section, typical.*

*Note 2: Generally, unless noted otherwise in the corresponding full Specification section, other products having the same characteristics, and fully meeting all the criteria, will not be excluded.*

**05 50 00- Metal Fabrications (exterior)**

Finish: Hot dipped galvanized with zinc coating 600 g/m<sup>2</sup> to CAN/CSA-G164 (MT-5) after fabrication. Touch up in field;

**06 20 00- Finish Carpentry**

Finish: MPI INT 9.2B, level 3;

Colours: to match existing building colour schemes (provide sample for approval)

**07 42 00- Metal Wall Panels**

Accepted Product: "Mini Flush" zinc alloy wall and soffit panels as fabricated and installed by LMC Manufacturing Ltd. of Burnaby, BC.

Colour: to match Rheinzink Blue-Grey

**07 42 43- Composite Wall Panel System**

Pre-finished smooth surface fiber cement board.

Accepted product: Swisspearl Cement Composite wall panel system, Sigma 8, distributed by Muralis Architectural.

Colours:

- .1 Composite Wall Panel 1: Nom. 2500 x 610 / 305mm horizontal running bond  
Reflex 9291 White Satin
- .2 Composite Wall Panel 2: Max 2500 X various, vertical layup  
Carat 7025 Black Opal
- .3 Composite Wall Panel 3: Perforated (ref. drawings for pattern)  
Reflex 9291 White Satin
- .4 Composite Wall Panel 4 (soffit): Nom. 2500 x 610 / 305 running bond with  
Reflex 9291 White Satin  
Cont. demountable access panels in some locations

**07 62 00- Sheet Metal Flashing & Trim**

1. Zinc coated steel sheet: to ASTM A653/A653M, with Z275 designation zinc coating,  
+ PPG Fluoropolymer coating

Colours: to match Metal Wall Panels

2. Aluminum sheet: minimum 22 gauge

Finish: Clear anodized to match Aluminum Windows;

**08 44 13- Glazed Aluminum Curtainwall**

Finish: Clear Anodized

**09 90 00- Architectural Painting & Coating**

Standard: MPI Premium Architectural grade, u.n.o.  
Systems & Colours: refer to individual material sections

**09 25 00 Gypsum Board**

Finish: MPI INT 9.2B, level 1 sheen for ceilings, level 3 for walls;  
Colours: to match existing building colour schemes (provide sample for approval)

**END**