Resort Municipality of WHISTLER

PROJECT MANUAL

Whistler Municipal Alternate Solutions Building Sprinkler Systems Install

4325 Blackcomb Way, Whistler, BC

PREPARED BY

S2ARCHITECTURE

ISSUED FOR BID
Project No.: 224034
DATE: 2024-06-25

Owner:

Resort Municipality of Whistler

4325 Blackcomb Way, Whistler, BC

Name of Project:

Whistler Municipal Alternate Solutions
4325 Blackcomb Way, Whistler, BC
Project No.: 224034

Professional Seals and Signatures:

Seals and Signatures attached to this Section authentic use of the Specifications only for the document set described above and are provided by the listed Registered Professional in accordance with provincial legislation and standards of conduct described by regulatory bodies.

Registered Professional:

Name: Peter Streith,
Architect, AAA, SAA, OAA, AIBC, FRAIC

S2 Architecture

Address: #401, 12068 - 104 Ave. NW
Edmonton, AB T5K 0K2

Phone: 780.229.2450
email: p.streith@s2architecture.com

Specification Sections:

DIVISION 02 – EXISTING CONDITIONS

Section 02 41 19 – Selective Building Demolition

DIVISION 06 - WOOD, PLASTICS AND COMPOSITES

Section 06 10 53 - Miscellaneous Rough Carpentry

DIVISION 07 - THERMAL AND MOISTURE PROTECTION

Section 07 05 00 - Common Work Results for Thermal and Moisture Protection
Section 07 05 53 - Fire and Smoke Assembly Identification
Section 07 23 00 – Building Insulation
Section 07 27 27 – Self-Adhered Vapour Permeable Membrane
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Section 07 62 00 - Sheet Metal Flashing and Trim
Section 07 84 00 - Firestopping
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DIVISION 08 - OPENINGS

Section 08 11 13 - Hollow Metal Doors and Frames
Section 08 71 00 - Door Hardware
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DIVISION 09 - FINISHES

Section 09 21 16 - Gypsum Board Assemblies
Section 09 91 00 - Painting

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A0.01 BUILDING SCHEDULES
A0.02 CODE ANALYSIS
A0.03 PHASING PLAN
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A2.01 LEVEL 1 FLOOR PLAN
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DIVISION 00 - PROCUREMENT AND CONTRACTING REQUIREMENTS

DIVISION 01 - GENERAL REQUIREMENTS

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DIVISION 09 - FINISHES

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SPRINKLER

MECHANICAL

CIVIL

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1. Method of Bidding

.1 Complete the Stipulated Price Bid Form in this Specification, signed and corporate sealed together with the security specified. Bid To:

RESORT MUNICIPALITY OF WHISTLER
Attention: Marc Freno

Email bid submissions to: fcmcapitalprokects@whistler.ca

Complete Stipulated Price Bid Form in legible manner, in ink, without typed or printed alterations or erasures. Submit Bids in email as follows:

EMAIL Bid submissions to **address indicated above**. Subject line to read: BID - Email size is limited to 35mb if files are larger than this please send multiple emails with sizes no larger than 35mb. Ensure sufficient time ahead of sending to allow for transmission and delivery prior to the deadline. Copies of Tender documents, and addenda will be posted on the FTP with access credentials provided to invited bidders for reference.

.2 Bid Close: **as indicated on BC BID website.**

.3 Base Bids in strict compliance with Drawings and Specifications and include all costs for the Project.

.4 Base Bids on the brands, products and requirements indicated or specified, or on brands or products that have been accepted as required under the heading "Acceptable Materials".

.5 Ensure all proposed Subcontractors are listed as per Appendix “B” in the Stipulated Price Bid Form. Failure to do so may result in Bid being rejected as being incomplete.

.6 Submission of the Bid will be construed as constituting approval of all terms and conditions set out in the Bidding Documents.

.7 Bidders are solely responsible for the delivery of their Bids in the manner and time prescribed.

.8 Complete Page 2 of the Stipulated Price Bid Form, Section 00 41 63 as follows:

.1 Limited Company: Print or type full name of company and name(s) and status of authorized signing officer(s) in space provided. Sign Bid Form only by authorized signing officer(s). Sign in the presence of a witness; affix the corporate seal. If the Bid is signed by officials other than the President and Secretary of the Company or the President, Secretary, Treasurer of the Company, a copy of the by-law resolution of the board of Directors authorizing such officials to sign, must be submitted with the Bid in the envelope.

.2 Partnership: Print or type name of partnership and name(s) of the person(s) signing in space provided. Insert the word "Partner" against each signature. Ensure all partners sign in the presence of a witness; the witness must also sign.

.3 Sole proprietorship: Print or type business name and name of sole proprietor in space provided, with the sole proprietor signing, in the presence of a witness who also signs. Affix seal. Insert the words "Sole Proprietor" under the signature.

.4 If the Bidder is a joint venture, each party will execute the Bid under seal in a manner appropriate to such parties. Disclose joint venture in accordance with the instructions above.

.9 Complete the Stipulated Price Bid Form in its entirety. Any items omitted or illegible, or any alterations to the text, or any conditions added on or submitted with the Stipulated Price Bid Form, may cause the Bid to be declared invalid and rejected.

2. Sufficiency of Bid

.1 The submission of a Bid constitutes an incontrovertible representation by the Bidder that:

.1 the Bidder has complied with all Bidding requirements,

.2 the Bidder is qualified and experienced to perform the Work in accordance with the Bid Documents,

.3 the Bid is based upon performing the Work in accordance with the Bid Documents, without exception, and

.4 the price or prices stated in the Bid cover all the Bidder's obligations under the Contract and all matters and things necessary for the performance of the Work in accordance with the Bid Documents.

3. Contract/Bidding Document Definitions

.1 Contract Documents are as defined in CCDC 2-2020, Definitions with General Conditions as modified by the Section 00 73 00 - Supplementary Conditions.

.2 Bidding Documents: Contract Documents supplemented with Instructions to Bidders, Stipulated Price Bid Form, Bid Securities, and Bid supplementary forms as contained herein.

.3 Bid: Act of submitting an offer under seal.

4. Acceptance or Withdrawal of Bids

.1 The Owner reserves the right to accept or reject any or all Bids, and to waive irregularities and informalities at its discretion.

.2 Without limiting the generality of the foregoing, any Bid may be rejected for being incomplete including FULL completion of the Appendices, having obscured or irregular erasures or corrections, interlineations, having requested Alternative, Separate, Itemized and Unit Prices omitted or for failure to provide an agreement to bond or undertaking of insurance certificate, unsigned, improperly signed or sealed, conditional, failure to use specified materials or systems or installers or installation methods, illegible, obscure, contain arithmetical errors or any other nonconforming, non-responsive and conditional Bids.

.3 The lowest or any bid will not necessarily be accepted. Tender evaluation will be based on price, team, previous experience, logistics plan, construction phasing plan, fire and life safety plan, etc.

.4 Resolve discrepancies between words and figures in favour of the words. Resolve discrepancies between indicated sum of any column of figures and the correct sum thereof, in favour of the correct sum.

.5 The Owner will notify successful Bidder, in writing, of the acceptance of his Bid, and thereafter, the Bidder will be required to execute the Contract within thirty (30) days of such notice of acceptance.

.6 A Bid may be withdrawn at any time up to the time stated for receiving Bids, but only on a request in writing, signed by the Bidder or his authorized representative.

.7 A Bid may not be withdrawn at or after the time stated for receiving Bids and will be open to acceptance by the Owner
- .1 until another bidder has entered into a Contract with the Owner for the performance of the Work, or,
- .2 until 60 days after the time stated for receiving Bids, whichever comes first.

.8 The 45 day period referred to above commences at 12:00 a.m. (midnight) of the day stated for receiving Bids and terminates at 12:00 a.m. (midnight) of the 60th day thereafter. If the 60th day falls on a Saturday or a Sunday, or a statutory holiday, omit such day or days from the computation and extend to the next business day.

.9 Amendments to the submitted Bids will be permitted if received in writing prior to time stated for receiving of Bids and if endorsed by the same party or parties who signed and sealed the Bid.

.10 Verbal, telephonic, telegraphic, hardcopy or faxed Bids or amendments to Bids, will not be considered. EMAIL BIDS ONLY.

.11 Where a modification is directing a change in the Bid price, ensure that the modification does not reveal the original price nor the revised price. State only the amount added to or deducted from the original Bid Price.

.12 The Owner will not accept responsibility for the content of modifications, or modifications that are, for any reason, delayed, illegible or otherwise improperly received. The Owner may disregard modifications that are improperly received. It is the Bidders responsibility to ensure that the modifications to the Bid have been properly received.

.13 The Owner reserves the right to negotiate contract terms with the lowest, or any Bidder.

.14 After a Bid has been accepted, all Bid Securities will be returned to the respective unsuccessful Bidders.

5. Confirmation of Insurance

.1 Provide a signed "Undertaking of Insurance Certificate" on a standard form provided by the insurance company, stating their intention to provide insurance requirements of the Contract Documents. Provide a certificate of Insurance evidencing:
- .1 Commercial General Liability insurance in the amount of $5,000,000 per occurrence and $10,000,000 Aggregate.
- .2 Property and Equipment of contractor and sub-contractors
- .3 Automobile $5,000,000 per occurrence
- .4 30 days cancellation notice
- .5 Whistler Municipality added as an Additional Insured to the policy.
- .6 Evidence and confirmation of insurance coverage for Course of Construction and Wrap up included.

6. Bonds

.1 Submit with the Bid, a Consent of Surety from a recognized bonding company to furnish a fifty percent (50%) Performance Bond and a fifty percent (50%) Labour and Materials Payment Bond for this Work.
.2 Include the cost of bonds in the Bid Price.
.3 Certified cheques shall not be accepted in lieu of Bond.
.4 Consign Bid Bonds to the Owner.
.5 Properly execute Bid Bonds by both Bidder and Surety. Endorse the Bond in the name of the Owner as obligee, signed and sealed by the Bidder and the Surety Company.
.6 Provide a signed "Undertaking of Insurance Certificate" on a standard form provided by the insurance company, stating their intention to provide insurance requirements of the Contract Documents.

7. Performance Bond, Labour & Materials Payment Bond

.1 The successful Bidder will be required to provide and pay for a Performance Bond and a Labour & Materials Payment Bond in accordance with CCDC 2, GC 11.2 - Contract Security, of the General Conditions of the Contract, each covering fifty (50%) of the total Contract Price. Include cost of bonding in Bid Price.

.2 Submit contract security to the Owner within 15 days of date of receipt of notice of acceptance of Bid.

.3 Provide Performance Bond in accordance with Standard Form of Performance Bond CCDC 221, and Labour and Materials Payment Bond in accordance with Standard Form of Labour and Materials Payment Bond CCDC 222, both issued by a Surety Company licensed to conduct business in the Province of British Columbia.

8. Safety

.1 Bids will only be considered where the Bidder has received a valid Certificate of Recognition (COR) as issued by the British Columbia Construction Safety Association or other certifying organization authorized by Human Resources and Employment, indicating compliance with Bill 48, prior to Bid closing. Provide a copy of the Certificate of Recognition (COR) with the Bid. Any Bidder that cannot provide the above mentioned proof of accreditation will have their Bids rejected for non-compliance.

9. Qualifications

.1 As further described in the General Conditions, the Owner reserves the right to reject a proposed Subcontractor for reasonable cause.

.2 Subcontractors and suppliers may be required to submit evidence at any time after the submission of Bids, as to their ability to carry out the Work and be prepared to satisfy the Consultant as to their competency.

.3 Provide with the Bid, the names of the Superintendent proposed for the project and office personnel as submitted with Bid.

10. Bidding Documents

.1 Examine the following Bidding Documents:
- .1 The Stipulated Price Bid Form including Section 00 41 63.
- .2 Letter of Invitation to Bid.
- .3 Instructions to Bidders.
- .4 General Conditions.
- .5 The specifications, comprising Divisions 00 to 49 inclusive, as indicated in the Table of Contents.
- .6 The drawings.
- .7 Any Addenda issued.

11. Interpretation of Bidding Documents

.1 If any person contemplating submitting a Bid on this work is in doubt as to the true meaning and intent of any part of Drawings and Specifications, he must request in writing, the Consultant for an interpretation thereof. If such an interpretation is not requested, the Bids will be presumed to be based upon the interpretation of directions that may be subsequently given by the Consultant after award of the Contract, in accordance with the provisions of the Contract.

.2 Advise the Consultant immediately of any discrepancies, ambiguities omissions or conflicts in the Bidding Documents. The Consultant will issue an addendum if he deems it necessary. Forward all requests to the Consultant in writing.

.3 Direct questions in writing regarding interpretation and clarification of Bidding Documents as follows: (only questions submitted via email at the address below will be considered):

S2 Architecture
Attention: Michal Lomaszkiewicz
M.Lomaszkiewicz@s2architecture.com

.4 Questions must be submitted no later than five (5) business days prior to the tender closing date.

12. Examination of Documents and Site

.1 Examine Drawings and Specifications. The failure or omission of any Bidder to receive or examine any document, or to visit site and acquaint himself with the existing conditions will not relieve the Bidder from any obligation with respect to his Bid.

.2 Check that Bidding Documents are complete and correspond with List of Drawings and the Table of Contents of the Specifications. Notify the Consultant of any omissions. Written instructions in the form of Addenda will be issued. Questions must be received in writing not less than five (5) working days before the Bid call date.

.3 Bidders must examine all drawings and read through all Divisions of the Specifications, so that they are fully conversant with the scope of the Documents.

.4 The Consultant does not guarantee site information indicated in the Bid Documents, and each bidder must evaluate such information relative to the actual conditions.

.5 Visit site of proposed work, and note conditions as they exist, and the facilities, difficulties and restrictions involved. A mandatory prebid site visit will be held **at time and location indicated**

on FTP site. Meet at front entrance of building. It is the Bidders responsibility to visit the prior to submitting a bid. Each proponent must be a party of two (2) persons only.

.6 Each proponent must be a party of two (2) persons only. All Contractors and Subcontractors must carefully inspect the site and take note of all site dimensions and compare site conditions with the bidding documents.

13. Addenda

.1 Prior to the date Bids are received, any and all interpretations of the drawings and specifications will be in the form of written addenda. Neither the Consultant nor sub-consultants will be responsible for verbal or any other explanations or interpretations of Drawings and Specifications.

.2 Addenda, if issued, will be sent as promptly as is practicable to all firms or persons to whom complete Bidding Documents have been issued and will become part of the Contract Documents. All queries are to be in written form submitted by e-mail to the person and location identified in 10.3 of this Section.

.3 Confirm receipt of all Addenda in the Stipulated Price Bid Form.

.4 Addenda will supersede and amend the drawings, specifications and schedules as set forth therein.

14. Product Options & Substitutions

.1 Product options: Comply with requirements of Division 01.

.2 Substitutions:

.1 Where products are specified by a proprietary specification, and substitutions are permitted, Bidders may base their Bids on a named product or manufacturer or on unnamed substitutions, subject to the requirements specified for substitutions in Division 01.

.2 During the Bid period, it is the sole responsibility of each Bidder to determine whether a substitution meets the requirements specified.

.3 The Consultant will not consider requests for approval of substitutions from Bidders during Bid period.

.4 Substitutions will be evaluated and approved or rejected by the Consultant after contract award.

.3 Product Acceptability:

.1 The Consultant may, after Bid submission and before contract award, require any Bidder to submit proof that a product proposed for use complies with requirements of Bid Documents. Provide such proof in the form of product data as specified.

.2 Should the Consultant determine that a proposed product does not meet requirements of Bid Documents, Bidder must propose a product which, in the Consultant's opinion, does meet requirements of Bid Documents, otherwise such Bidder's Bid may be declared invalid and rejected.

15. Trade Union Labour

.1 It is not a requirement that workers on the site belong to a trade union.

.2 With respect to Union and non-union labour, this project will be an "OPEN SITE" and the bidder is to make the necessary allowances and provisions in the bid price accordingly.

16. Anticipated Project Schedule

.1 As indicated on FTP site.

END OF INSTRUCTIONS TO BIDDERS

1. GENERAL

1.1 Definitions

.1 **Available Project Information:** Means only information of any type and in any form, related to Project and identified in this Section as such, and only as specifically referenced in this section.

1.2 Status of Available Project Information

.1 Available Project Information identified in this section, or any part thereof, are not part of Contract unless specifically incorporated into Contract Documents by means of copying, transcribing or referencing.

1.3 Use of, and Reliance Upon, Available Project Information

.1 Available Project Information are made available to Bidder for the purpose of providing Bidder with access to information available to Owner, Contractor, and Consultant.

.2 Available Project Information shall not be considered a representation or warranty that information contained therein is accurate, complete, or appropriate.

.3 Bidder shall interpret and draw conclusions about Available Project Information and are encouraged to obtain specialist advice with to this information.

.4 Owner and Consultant assume no responsibility for such interpretations and conclusions.

.5 Information contained in Available Project Information may be time sensitive and dates shall be considered when interpreting Available Project Information.

.6 Bidder may rely upon data contained in Available Project Information, or parts thereof, which are specifically incorporated into Contract Documents by means of copying, transcribing or referencing, but shall draw his own conclusions from such data and shall not rely on opinions or interpretations contained therein.

1.4 Available Project Information

.1 The following Available Project Information have been attached as Appendix A, but are not incorporated into Contract Documents:

.1 Alternate Solutions Report
Whistler Municipal Hall
4325 Blackcomb Way, Whistler, BC
April 25, 2024
Prepare by Pontem Group.
File No: PG210173
32 pages

.2 The following Available Project Information have been attached after Section 02 82 16, but are not incorporated into Contract Documents:

.1 Hazardous Materials Inspection Report
Prepared by: Antiquity Environmental Consulting Ltd
Prepared for: Resort Municipality of Whistler, BC
Date: March 13, 2017
118 Pages

2. EXECUTION

2.1 Not Used

END OF SECTION

TO: **RESORT MUNICIPALITY OF WHISTLER**
Attention: MARC FANO

PROJECT: **Whistler Municipal Alternate Solutions**
BUILDING SPRINKLER SYSTEM INSTALL
4325 Blackcomb Way, Whistler, BC

BIDDER: _____
(Legal Name)

_____
(Street Address)

_____
(City, Province, Postal Code)

1 Bid Price

1.1 Having examined the site, the Bid Documents as listed in Table of Contents, and Drawings, and addenda issued by S2 Architecture (Bidder to fill in addenda received):

Addendum Number	Issue Date	Addendum Number	Issue Date	Addendum Number	Issue Date

1.2 and confirming that our Bid Price is based on specified materials and methods only,

1.3 and confirming that our Bid Price excludes Provincial Taxes and Goods and Services Tax,

1.4 I/We hereby offer to enter into a Contract to perform the Work required by the Bid Documents, and to furnish all materials, plant and labour necessary for the proper completion of the Work for the stipulated price indicated below in lawful money of Canada.

_____ Dollars ($_____)
(Bid Price in words, excluding GST) (total in figures)

_____ Dollars ($_____)
(GST + Provincial taxes in words) (total in figures)

_____ Dollars ($_____)
(Total Cost of the Work, Bid Price + taxes in words) (total in figures)

1.5 Submitted this_____ day of _____ 20_____

2 Declarations

2.1 We agree to complete the Work within _____ months from receipt of Letter of Bid Acceptance;

2.2 No person, firm or corporation other than the undersigned has any interest in this Bid or in the proposed Contract for which the Bid is made;

2.3 This bid shall be held irrevocable and is open to acceptance by the Owner until 45 days after the bid closing time;

2.4 In submitting this Bid we understand that revised bids shall not be called if minor changes are contemplated by the Owner.

2.5 We agree that within ten (10) days after notification in writing by the Owner of the acceptance of this Bid within the time limits of the bid acceptance period stated above, that we will:

2.5.1 Execute this Agreement between Owner and Contractor.

2.5.2 Furnish and pay for a Performance Bond, in an amount equal to fifty percent (50%) of the total Contract Price.

2.5.3 Furnish and pay for a Labour and Material Payment Bond, in an amount equal to fifty percent (50%) of the total Contract Price.

2.5.4 Commence construction within 10 days of the date of acceptance of this Bid or other longer period as may be approved in writing by the Owner, or his representative.

3 Attachments

3.1 This Bid includes the following:

3.1.1 A Consent of Surety issued by a company licensed to carry on such business in Canada, and in Province of Work for the Performance and Labour and Material Payment Bonds in the amounts listed above;

3.1.2 A List of Subcontractors and Price Breakdown, is appended hereto and identified as Appendix “A”, and is submitted with bid.

3.1.3 A List of Separate and Itemized Prices, is appended hereto and identified as Appendix "B" to be submitted with Bid. NOT USED

3.1.4 A List of Alternate Prices is appended hereto and identified as Appendix "D" to be submitted with Bid. NOT USED

3.1.5 A List of List of Contractor Proposed Substitutions is appended hereto and identified as Appendix "E" to be submitted within two (2) days of notification of award of Contract, but no later than the Project Start-Up Meeting.

4 Signatures

SIGNED, SEALED AND SUBMITTED for and on the behalf of:

signature of Bidder's authorized representative

name of Bidder's authorized representative

witness's signature or corporate seal

title or status of person signing above (print or type)

name and title of witness

APPENDIX A – LIST OF SUBCONTRACTORS FORM

PROJECT: **Whistler Municipal Alternate Solutions**
BUILDING SPRINKLER SYSTEM INSTALL
4325 Blackcomb Way, Whistler, BC

BIDDER: _____
(Legal Name)

Note: Where the bidder does not intend to employ a subcontractor he shall insert "Own Forces" in space provided. If item of Work is not applicable to project insert "N/A".

Item of Work	**Subcontractor or Supplier**	**Itemized Price Amount**
Mechanical		
Electrical		
Demolition		
Haz mat abatement		
Building Insulation		
Air Vapour Membrane		
Siding		
Flashing and trim		
Steel doors and glazing		
Hardware		
Gypsum board assemblies		
Painting / Repainting		
Structural		

Corporate Seal _____

_____
SIGNATURE OF AUTHORIZED REPRESENTATIVE

APPENDIX B – SEPARATE AND ITEMIZED PRICE FORM

PROJECT: **Whistler Municipal Alternate Solutions**
BUILDING SPRINKLER SYSTEM INSTALL
4325 Blackcomb Way, Whistler, BC

BIDDER: _____
(Legal Name)

SEPARATE PRICES

The following are our Separate Prices for the Work listed hereunder. Such Work and amounts are NOT INCLUDED in our Stipulated Price and DO NOT include GST.

The Prices listed are firm until date of Substantial Performance of the Project. These prices include all labour, material, equipment, supervision, transportation, financing, overhead and fees to complete the work as listed.

Separate Price	Description of Separate Price Work	Amount ($)
1	Not Applicable	$
2		$

ITEMIZED PRICES

The following Itemized Prices ARE INCLUDED in our Stipulated Price and are herein broken out separately for Owner's Accounting purposes, and DO NOT include GST.

Itemized Price	Description of Itemized Price Work	Amount ($)
1	Not Applicable	$

APPENDIX D – ALTERNATE PRICES FORM

PROJECT: **Whistler Municipal Alternate Solutions**
BUILDING SPRINKLER SYSTEM INSTALL
4325 Blackcomb Way, Whistler, BC

BIDDER: _____
(Legal Name)

The following are our prices for the Alternate Work listed hereunder. Such Alternate Work and amounts are NOT INCLUDED in our Bid Price and DO NOT include GST.

Description of Alternate Work	Effect on Stipulated Price ($) Addition	Deletion
Not Applicable	$	$
	$	$
	$	$
	$	$

APPENDIX E – CONTRACTOR PROPOSED SUBSTITUTIONS

PROJECT: **Whistler Municipal Alternate Solutions**
BUILDING SPRINKLER SYSTEM INSTALL
4325 Blackcomb Way, Whistler, BC

BIDDER: _____
(Legal Name)

The following are our prices for the Substitution Work listed hereunder. Such Substitution Work and amounts are NOT INCLUDED in our Bid Price and DO NOT include GST. This list shall be completed within fifteen days (15) of notification of award of contract and submitted to the Consultant at the Project Start-Up Meeting. Coordinate with Section 00 21 00 – Instructions to Bidders.

Specification Section Number	Name of Proposed Substitution	Effect on Stipulated Price ($) Addition or Deletion

END OF SECTION

1. General Conditions

The General Conditions of this Contract are the General Conditions of the Stipulated Price Contract, Canadian Standard Construction Document CCDC 2 - 2020. Where any part of the General Conditions is modified or voided by the Supplementary Conditions, the unaltered provisions **shall** remain in effect.

2. Definitions

The definitions included with CCDC 2 and as modified in the Supplementary Conditions are incorporated as part of the Contract Documents.

3. Agreement Between Owner and Contractor

. 1 The Contractor will be required to execute the agreement with the Owner incorporated in CCDC 2.

4. General Conditions - List of Articles

The following is a list of the headings to the **General Conditions Articles of CCDC 2:**

Part 1 - General Provisions
GC 1.1 Contract Documents
GC 1.2 Law of the Contract
GC 1.3 Rights and Remedies
GC 1.4 Assignment

Part 2 - Administration of the Contract
GC 2.1 Authority of the Consultant
GC 2.2 Role of the Consultant
GC 2.3 Review and Inspection of the Work
GC 2.4 Defective Work

Part 3 - Execution of the Work
GC 3.1 Control of the Work
GC 3.2 Construction by Owner or Other Contractors
GC 3.3 Temporary Work
GC 3.4 Construction Schedule
GC 3.5 Supervision
GC 3.6 Subcontractors and Suppliers
GC 3.7 Labour and Products
GC 3.8 Shop Drawings

Part 4 - Allowances
GC 4.1 Cash Allowances
GC 4.2 Contingency Allowances

Part 5 - Payment
GC 5.1 Financing Information Required of the Owner
GC 5.2 Applications for Progress Payment
GC 5.3 Payment
GC 5.4 Substantial Performance of the Work and Payment Holdback
GC 5.5 Final Payment
GC 5.6 Deferred Work
GC 5.7 Non-conforming Work

Part 6 - Changes in the Work
GC 6.1 Owner’s Right to Make Changes
GC 6.2 Change Order

END OF SECTION

Supplementary Conditions To
CCDC 2-2020
Stipulated Price Contract

By and Between

<contractor>

and

Resort Municipality of Whistler

_____

Contract Name

_____

Dated as of

_____

1.0 REFERENCE

1.1 The Canadian Standard Construction Document, CCDC 2-2020, Stipulated Price Contract, consisting of the Agreement between the *Owner* and *Contractor*, Definitions and the General Conditions of the Stipulated Price Contract, and these Supplementary Conditions are part of the *Contract Documents*.

1.2 These Supplementary Conditions supplement or amend the Agreement, Definitions and General Conditions of the Stipulated Price Contract, Supplementary Conditions shall be read in conjunction with, and in the case of conflict, take precedence over the Agreement, Definitions and General Conditions. Where any of the Agreement, Definitions and General Conditions are supplemented or amended hereinafter, the unaffected provisions of such Agreement, Definitions and General Conditions shall remain in effect. Supplementary Conditions to any Agreement, Definitions and General Conditions shall be considered added thereto. Amendments to any provisions of the Agreement, Definitions and General Conditions shall be considered as superseding the affected provision thereof.

2.0 GENERAL CONDITIONS OF THE STIPULATED PRICE CONTRACT

2.1 GC 1.1 Contract Documents

2.1.1 Delete GC 1.1.5 in its entirety and replace with the following:

"1.1.5 If there is a conflict within the *Contract Documents*:

.1 the order of priority of documents, from highest to lowest shall be

- the Supplementary Conditions
- Agreement between the *Owner* and *Contractor*,
- the Definitions
- the General Conditions
- Division 01 of the *Specifications*
- technical specifications
- material and finishing schedule
- the *Drawings*.

.2 Drawings of a larger scall shall govern over those of a smaller scale of the same date.

.3 dimensions shown on *Drawings* shall govern over dimensions scaled from *Drawings*.

.4 amended or later dated documents shall govern over earlier documents of the same type.

.5 noted materials and annotations shall govern over graphic indications.

2.2 GC 4.1 Cash Allowances

2.2.1 Delete GC 4.1.2 in its entirety and replace with the following:

"4.1.2 The *Contract Price* and the cash allowances, includes the *Contractor*'s overhead and profit in connection with such cash allowances; and, the cash allowances are subject to a 15% markup on vendor invoice pre-tax value."

2.2.2 Delete the phrase "without any adjustment" from the second line in GC 4.1.5 and substitute in its place "subject to a 15% markup on vendor invoice pre-tax value".

2.3 GC 6.4 Concealed or Unknown Conditions

2.3.1 The parties agree that GC 6.4.1 is added to *Agreement* in its entirety notwithstanding the obligations of GC 6.4.1 having been deleted in the *Contractor*'s proposal documents.

2.4 GC 9.5 Mould

2.4.1 Add the following new clause as GC 9.4.5:

"9.4.5 Notwithstanding anything to the contrary, GC 9.5 applies exclusively to the *Work* and expressly excludes any pre-existing buildings, structures or facilities located at the *Place of the Work*.

2.5 CG 11.1 Insurance

2.5.1 Add the words "as amended" after the words "as specified" and before the words "in CCDC 41".

2.5.2 Add the words "in the amount of $5,000,000 value inclusive per occurrence" after the words "Automobile Liability Insurance" at GC 11.1.2.

2.5.3 Delete GC 11.1.13 in its entirety.

2.5.4 Delete CCDC 41 Section 3 and Section 4 in their entirety.

END OF THIS SECTION

1. GENERAL

1.1 Work Of This Contract

.1 Work of this Project is comprised of the following:

Whistler Municipal Alternate Solutions
BUILDING SPRINKLER SYSTEM INSTALL
4325 Blackcomb Way, Whistler, BC

.1 As indicated on Drawings and Specifications.

.2 Physical Limits: Work of this Contract in not necessarily limited to the work within the property lines of the site, and includes work required by the Contract Documents, both within and outside of the Property lines.

.3 Contractual Arrangements: This project shall be performed under a single contract using a standard contract form and supplementary conditions (if any).

1.2 Substitutions and Product Options

.1 Substitutions: Means all materials, products, systems components, and all other items used in the Performance of the Work that, in the opinion of the Contractor meet the requirements of the named Acceptable Products or Basis-of Design Products listed in the Technical Sections of the Project Manual; and are submitted to the Consultant in accordance with the requirements of this Section.

.2 Unsolicited Substitutions: Means Substitutions found in the Work that have not been formally accepted by the Consultant in accordance with the requirements of this Section or, that have been reviewed by the Consultant and no formal documentation to incorporate the material, product, system component or all other items into the Contract have been received by the Contractor. All such unsolicited substitutions found in the work may result in a request to remove all affected work and have it replaced with the specified materials, including affected adjacent work, or accepted with a suitable credit to the contract where substitution is found suitable for the affected work as described later in this Section.

.3 In making application to the Consultant for consideration of a Substitution the Contractor guarantees:

.1 That it has personally reviewed and investigated the proposed substitution and has determined that performs in an exactly similar or superior manner to the Product or method specified.
.2 That the same or better guarantees can be obtained and will be provided as for the specified product or method of Construction.
.3 That it will coordinate the installation of the accepted substitution into the Work and make all revisions, changes and modifications to the Work as required to incorporate the approved substitute product or method of construction.
.4 That it will bear all costs and waive all claims for additional compensation in either contract price or contract time that subsequently become apparent due to the incorporation of the substitution.
.5 That the price quotation is complete, and all costs related to the substitute product or construction method have been included including but not necessarily limited to revisions or adjustments to:

.1 The Construction layout.
.2 Adjacent construction.

.4 The Consultant, at the sole discretion, may consider the Contractor's Proposed Substitutions where:

.1 Products selected by the Contractor from the Acceptable Products or Basis-of-Design Products listings in the individual Technical Sections are not available.

.1 Where a Proposed Substitution is made on the premise of unavailability; the Contractor is required to provide sufficient evidence clearly indicating that the specified Acceptable Products or Basis-of-Design Product cannot be obtained due to unavailability.

.2 The Contractor's overall construction schedule would be adversely affected by the manufacturers or suppliers stated delivery schedule.

.1 In making a proposed substitution based on schedule impacts; the Contractor must provide evidence to the Owner and the Consultant in writing, that the manufacturers or suppliers stated delivery dates will adversely impact the overall project completion date.

.3 Other products, materials, systems, components, items, or methods of construction deemed, in the opinion of the Contractor, as being capable of performing in an exactly similar manner or superior to the products, materials, systems, components or items specified and, where verification can be provided that the Proposed Substitution will

.1 Meet or exceed all appropriate Codes, Laws, By Laws, regulations, and guidelines applicable to the Place of Work.
.2 Meet or exceed the aesthetic requirements specified for the Project.

.4 Products or methods of construction that add cost to the Contract Price may, at the discretion of the Consultant in consultation with the Owner, be considered where additional value or life cycle cost benefits can be clearly identified and demonstrated.
.5 No substitution will be considered until full implication of the change to Consultant's design and redesign has been fully considered.

.5 When in the opinion of the Consultant the Proposed Substitution is deemed acceptable for use on the Project either in whole or in part, it remains the responsibility of the Contractor to:

.1 Accept responsibility for all costs, including any additional project administration costs incurred by the Consultant, where the Substitution affects any other work or portions thereof.
.2 Accept and pay for all amendments, adjustments, modifications, or other revisions required to be made to the Contract Documents as a result of substitution.
.3 Ensure and verify that all drawings incorporating and coordinating parts of affected Work bear the seal and signature of an architect or engineer registered in Province of the Work

.6 Product Options: Select any product, material, system, assembly, component, or item based on their performance or prescriptive descriptions and criteria and, that meets or exceeds the specified standards for products, materials, systems, assemblies, components, or items specified in the Technical Sections.

.1 Acceptable Products: Select any named Product, assembly or material contained in the listing of Acceptable Products.
.2 Basis-of-Design Products: Use the named Product contained in the Basis-of-Design Products listing unless an addendum is issued indicating acceptance of additional Acceptable Products.
.3 Incorporation of Specified Options: Contractor agrees to coordinate the installation of the selected Product Option into the Work and further agree to:

.1 Make all changes in the Work as necessary accommodate the selected Product Option.
.2 Immediately and without delay, notify the Consultant where the selected Product Option is inconsistent with the layouts and configurations indicated in the Contract Documents.

.3 Be responsible for, pay all costs and waive all future claims for additional compensation related to costs incurred that are implicit in the use of listed Product Options including all costs for excess administration and where required re-design, and preparation of drawings and details by undertaken by the Consultant to accommodate use of the Product Option.

1.3 Project Coordination

.1 Project Coordination: All Subcontractors shall participate in project coordination requirements; specific parts of the Work will be assigned to the appropriate Subcontractors by the Contractor for coordination of that portion of work.

.2 General Project Coordination: Coordination items that normally apply to all components of the Project Manual and the Work include but are not necessarily limited to the following:

.1 Schedule Coordination: Subcontractor shall coordinate all construction activities with the by Contractor's overall construction schedule to ensure orderly, timely and most efficient installation of materials, components, systems, and all other items required by the Contract Documents and to ensure satisfactory completion of the Work.
.2 Where other work is dependent upon completion of another portion of work; that Subcontractor whose work is required to be completed prior to beginning other work shall, either before or immediately after completion of their portion of Work, notify the Contractor.
.3 Subcontractors are required to coordinate and make appropriate and suitable provision for all work scheduled to be installed at a later date by other Subcontractors, under separate contract or by the Contractor's own forces.
.4 The Contractor will schedule and coordinate construction activities at the Place of Work to obtain the best results and ensure all products, material, components, systems, and other items achieve maximum accessibility required for maintenance, servicing, and repair.

.3 Contractor will supervise Work, Subcontractor shall:

.1 Provide consistent sized joint widths in all exposed Work. Arrange all joints in exposed Work to obtain the best aesthetic appearance. Where choices for aesthetic appearance are available; refer all such questionable choices to by Contractor who will defer to the Consultant for final decision.
.2 Install each component during climatic conditions and Project status that ensures the best possible results for performance and aesthetics.
.3 Isolate each part of all completed construction from all incompatible materials as deemed, in the opinion of the Contractor as being incompatible, to prevent deterioration or adverse effects of the completed Work.
.4 Coordinate temporary enclosures with all required inspections and tests, to minimize unnecessarily uncovering completed construction for the purposes of allowing required testing and inspections to be completed.
.5 Where mounting heights are not indicated; Install individual components at standard mounting heights recognized within the industry for applications indicated. Refer questionable mounting height decisions to Contractor, who will defer to the Consultant, for final decision.
.6 Coordinate all construction activities ensuring that the Work or any part thereof; completed or in progress, is subject to harmful, dangerous, damaging, or otherwise deleterious exposure from onset of the Project until Final Completion.

.4 Project Management and Electronic Project Management Software.

.1 The Consultant will manage and track all Requests for Interpretation, Requests for Clarifications, Consultant Recommendations, Site Instructions, Proposed Change Notices, Change Orders, Change Directives, Site Visit Reports, and Certificate for Payments, Shop Drawings transmittals, Substitution Requests, Meeting Minutes, and all other forms of Construction Communication required for the Project. The Consultant's version of all Construction Administration documentation will be considered the official record for the project.

.2 Contractor may use their own electronic management software for managing their in-house operations, but will be required to use the Construction Administration forms, templates and other administrative documentation provided by the Consultant and submit all such documentation in a method as specified by the Consultant which includes but is not limited to the following:

.1 Electronic Mail Transmissions (email).
.2 Uploading to a Project File Transfer Protocol (FTP).

.3 Contractor will be responsible to coordinate the mutually agreed upon timelines for Requests for Interpretation, Requests for Clarification, Shop Drawing reviews and other submittals requiring Owner, Consultant or Sub-consultant reviews, such agreed upon times frames, if different than those specified in the Contract Documents will be amended by Change Order.

1.4 Project Meetings

.1 Administrative Procedures: Contractor will schedule and administer project progress meetings throughout the entire duration of the work.

.2 The Contractor will:

.1 Distribute written notice of each meeting not less than four (4) days in advance of each meeting date.
.2 Record the minutes of the Meeting and include significant proceedings and decisions, identify parties requiring action.
.3 Reproduce and distribute copies of meeting minutes within three (3) days after each meeting, and transmit to meeting participants, all affected parties not in attendance, the Contractor, and the Owner.
.4 Require the Contractor to provide physical space and plan for Project Meetings.

1.5 Progress Schedule

.1 Contractor shall, within two (2) weeks subsequent Contract award, submit a draft of Progress Schedule for Work to the Consultant for review and comment. The Consultant may request minor changes or clarifications to the draft Progress Schedule that do not affect Contractor's right to control of Work.

.2 Submit within two (2) weeks, a full and completely itemized Construction Schedule clearly identifying stages of the Work, and all portions of Work thereof.

.3 Subsequent to Consultant review of the Draft Progress Schedule the Contractor shall clearly identify specific dates for shop drawing review and all other submittals, up to completion of Work including but not necessarily limited to the following items:

.1 Include all intermediary dates for specific portions of Work to be completed for Owner's use and dates for receiving and installing all Owner purchased or supplied products and equipment.
.2 Do not change Schedule without the Consultant's written acceptance. Submit to the Owner and the Consultant, written notification of the intent to change and provide reasons for the change for the Owner and the Consultant review and make comment on. Schedule revisions will be addressed in the form of a Change Order using the Consultant's standard form for Change Orders.

.3 Indicate actual progress relative to Progress Schedule noted above as part of Progress Claim.

1.6 Site Surveying and Laying Out

.1 Qualifications of Surveyor: Qualified registered land surveyor acceptable to Owner.

.2 Survey Requirements: Locate, confirm, and protect control points prior to starting site work. Preserve permanent reference points during construction and as follows:

.1 Establish two permanent benchmarks on site, referenced to established benchmarks by survey control points
.2 Record locations, with horizontal and vertical data in Project Record Documents
.3 Establish lines and levels, locate, and lay out, by instrumentation

.3 Records: Maintain a complete, accurate log of control and survey work as it progresses and as follows:

.1 On completion of foundations and major site improvements, prepare a certified Legal Survey and Real Property Report showing dimensions, locations, angles, and elevations of Work.

1.7 Subsurface Conditions

.1 Geotechnical Report: A geotechnical report has been prepared for this Project and is available for viewing under the following conditions:

.1 The opinions expressed in this report are those of geotechnical consultant and represent interpretations of subsoil conditions, tests, and results of analyses conducted by geotechnical consultant.
.2 Owner will not be responsible for interpretations or conclusions drawn from the report by the Contractor.
.3 Consultant has used the information for their own design purposes and will not be responsible for further interpretations or conclusions drawn from the report by the Contractor.
.4 Make additional test borings and conduct other exploratory operations necessary for excavation support and protection.

.2 Qualifications of Geotechnical Engineer: Use same geotechnical consultant that Owner retained to prepare Geotechnical Investigation and Construction Recommendations; use of geotechnical consultant that did not provide original report will not be permitted without Owner’s written permission.

.3 Confirmation of Subsurface Conditions: Proof roll sub-grade below building slabs and pavements using heavy pneumatic tired equipment to identify soft pockets and areas of excess yielding; proof roll dry subgrade having optimal moisture content, and as follows:

.1 Completely proof roll sub-grade in one direction, repeating proof rolling in direction perpendicular to first direction; limit vehicle speed to 5 km/h using a loaded 10-wheel, tandem axle dump truck weighing not less than 14 tonnes.
.2 Excavate soft spots, unsatisfactory soils, and areas of excessive pumping or rutting as determined by Consultant and replace with compacted backfill or fill as directed.

.4 Damaged Subgrade: Reconstruct subgrade damaged by freezing temperatures, frost, rain, accumulated water, or construction activities as directed by Consultant without additional compensation.

.5 Unauthorized Excavation: Fill unauthorized excavation under foundations or wall footings by extending bottom elevation of concrete foundation or footing to excavation bottom, without altering top elevation using lean concrete fill having 28-day compressive strength of 17.5 MPa; fill unauthorized excavations under other construction or utility pipe as directed by Consultant.

.6 Variations in Reported Subsurface Conditions: Promptly notify the Consultant in writing if subsurface conditions at the Place of the Work differ materially from those indicated in the Contract Documents, or a reasonable assumption of probable conditions based thereon:

.1 Use geotechnical consultant having qualifications listed above to confirm suitability of subsurface conditions for support of building slabs and pavements.
.2 Instructions will be issued for changes in the Work after prompt investigation where the Consultant determines that the conditions differ materially from those indicated in the original Geotechnical Investigation.

1.8 Submittals

.1 This Section identifies and provides general requirements and procedures of submittals for Consultant review including but not limited to, the following:

.1 Action Submittals: Submittals confirming constructability and conformity with the design intent, and that require review and acceptance by Consultant before beginning any work wither by the manufacturer or at the Place or Work.
.2 Informational Submittals: Submittals required for coordination of the Work, for delegated design elements not performed by the Consultant or for evidence of performance, and that do not require review by the Consultant.

.2 Electronic Submittals: will be accepted under the following conditions:

.1 Subcontractors are informed and advised that:

.1 The Consultant's email system is a tool of their business, and as such cannot ensure that they will be available to receive electronic submittals
.2 Interruptions in email system due to Contractor's internet service provider technical difficulties, Information Technology (IT) difficulties and all other interruptions and disruptions preventing the Contractor's submission from being received cannot be anticipated; therefore, the Consultant bares no responsibility in the event of technical interruptions faced by the Contractor.
.3 Inconsistencies, errors, or omissions in typing, spelling, and grammar due to user miss-entry, auto-correcting or other inconsistencies, errors and omissions that result in emailed Submissions being rendered "undeliverable" will not be the responsibility of the Owner or the Consultant.

.2 It remains the Contractor's responsibility to ensure the Consultant has received their electronically transmitted Submissions.

.3 Electronic Submission Protocol:

.1 Indicate the following in the "Subject" line of the email:

Whistler Municipal Alternate Solutions
Building Sprinkler System Install

.2 Electronic Transmittal Protocol: Provide the following text to appear in the body of the email transmission:

.1 Attention: <Insert Name>
.2 Project Name: <Insert Project Name>
.3 Project Number: <Insert Project Number>
.4 Name of Contractor: <Insert Name>

.5 Name of Subcontractor: <Insert Name>
.6 Name of Fabricator: <Insert Name>
.7 Name of Product or Assembly: <Insert Name>
.8 Please find attached our <insert submittal name> for <Insert Project Name> dated <Insert Date (month, day, year) > for your review.

.3 Compile all forms, certificates, drawings, required appendices and all other supplementary information into a single electronically transferrable document; and submit as a single attachment to an e-mail and as follows:

.1 Legible electronically compiled or scanned .PDF, .JPG, .TIFF or other format compatible with ADOBE or Microsoft Software; submittals that are not legible, incompatible with the above noted software or are incomplete will be rejected.
.2 Sheet Orientation: Orient sheets in the single .PDF, .JPG, .TIFF file; rotated to a "Ready-to-Read" orientation with the majority of text horizontal to the sheet with no additional adjustments or formatting required by the viewer.
.3 File Size: Maximum file sizes for delivery of PDF, JPG or TIFF files submittals are 8 Megabytes (MB).
.4 File Security: Do not set any permission(s) on the file; protected documents will not be accepted.
.5 File Format: "Zipped" or electronically compressed files may, at the sole discretion of the Consultant, be accepted, confirm acceptability with the Consultant prior to making any project related submission as a compressed file.

.4 Shop Drawings: Original drawings that are drawn accurately and to scale, modified standard drawings provided by manufacturers, or modified standard drawings provided by Contractor to clearly illustrate details of portions of Work, that are specific to project requirements and as follows:

.1 Electronic Drawing Files Available from Consultant: Electronic drawing files may, at the sole discretion of the Consultant, be made available to Contractor by Consultant for preparation of Shop Drawings specific to the Project subject to the following conditions:

.1 The following electronic drawing files will be made available at no cost to Contractor:

- Site Plans, Landscape Plans, Pile or Foundation Plans, Floor Plans, Reflected Ceiling Plans, Roof Plans, and similar drawing types.
- Drawings indicating detailed and specific wall or floor patterns and layouts may also be included with the package where it is essential to have a pattern or layout match in actual construction.
- Other drawings may be made available provided; the Contractor makes a detailed request outlining a specific need that benefits project.
- All documents considered proprietary including but not limited to the following and will not be provided:
  - Sections.
  - Details.
  - Elevations.
  - Other details and drawing information deemed, in the opinion of the Consultant to be proprietary.

.2 Electronic drawing files will be provided:

- Via e-mail or posted to FTP Site, depending on size and quantities of requested electronic drawing files.
- In the file format used for production of drawings, a change to the version or format will not be undertaken by the Consultant; Contractor will be responsible to engage or otherwise employ the services of a company, firm, agency, or other business who is not the Consultant, to change documents where formats do not meet the Contractor's ability to read them.

.3 Direct requests for electronic drawing files from Subcontractors will not be considered by the Consultant.
.4 Consultant will alter electronic drawing file information that, in the opinion of the Consultant, is deemed non-essential including, but not limited to:

- Removal of Title Blocks and Logos.
- Removal Professional Seals.
- Binding of External Files and Blocks.

.5 Contractor shall coordinate all Subcontractor requests for specific electronic drawing files; Contractor shall request all required electronic drawing files at beginning of Work:

- The Consultant makes no warranty or guaranty that dimensions provided or that are established by any party in possession of the electronic files, from the electronic drawing files represent actual site conditions.
- In the event that dimensions are not indicated, they shall not be scaled electronically from electronic drawing files. Missing dimensions shall be brought to the attention of Consultant, who will determine dimensions or direct method for determination of missing dimensions.
- The Contractor is responsible for establishing and confirming site dimensions and project conditions, and providing all such information to all affected Subcontractors.
- In event that there is a discrepancy between electronic drawing files provided to Contractor and Bid Documents, Addenda and Bid Revisions, if any, the Bid Documents, Addenda and Bid Revisions shall govern.

.6 The Contractor will be required to sign an agreement accepting terms of use and irrefutably recognizes that use of electronic drawing files is at their own risk:

- Contractor, Subcontractor, Sub-Subcontractor, supplier, manufacturer, or other third-party agent agrees to indemnify and hold harmless the Consultant from any damage, liability or costs arising from the use of electronic drawing files issued in file format provided.
- The Consultant retains all copyrights for electronic drawing files.
- Use of electronic drawing files for any other or subsequent Project, without express written consent of Consultant, is strictly prohibited.
- The Consultant will not be held liable or responsible in any way of any unauthorized use or modification of electronic drawing files provided.
- Consultant expressly disclaims any warranty or assurance that electronic drawing files will remain accurate beyond date that files were created.
- Consultant assumes no responsibility and disclaims any liability to any person or entity for any loss or damages including any special, indirect, or consequential damages caused by error or omissions in electronic drawing files and format provided, whether resulting from negligence, accident, or any other cause.

.7 Consultant reserves all rights to withdraw any and all offers for electronic drawing files without explanation.

.8 Consultant reserves the right to reject shop drawings prepared from electronic drawing files submitted to them by Contractor that have not been significantly altered from electronic drawing files provided, and as follows:

- Shop Drawings must and shall reflect constructability requirements
- Shop Drawings must and shall be detailed in accordance with requirements listed in technical specification sections

.2 Do not base Shop Drawings on reproductions of Contract Documents except as permitted by use of electronic drawing files noted above.

.1 Include the following information on Shop Drawings, as applicable:

- All pertinent Information cross referenced to applicable portions of Contract Documents.
- Include dimensions consistent with units shown on drawings; converted values are acceptable when items or information are not produced in indicated units.
- Identification of Products, Materials, systems, assemblies, components, and all other items that the Shop Drawings pertain to.
- Fabrication and installation drawings.

- Roughing-in and setting diagrams.
- Wiring diagrams showing site installed wiring, including power, signal, and control wiring.
- Shop work manufacturing instructions.
- Templates and patterns.
- Schedules.
- Design calculations.
- Compliance with specified standards
- Notation of coordination requirements by specific related Subcontractors; the term "By Others" will not be acceptable.
- Notation of critical dimensions established by site measurement, or that have to be maintained to fit components.

.5 Product Data: Submit Product data sheets including but not limited to; manufacturers' catalogue sheets, brochures, performance data, charts and diagrams, and all similar literature used to illustrate manufacturers standard Products, amended as follows:

.1 Delete all information not relevant to the project.
.2 Complement standard information to provide details applicable to project.
.3 Cross reference all Product data and information to applicable portions of Contract Documents.

.6 Samples: Submit samples for materials, assemblies, or equipment as examples of quality, finish, or standard of workmanship in quantities specified and when requested by the Technical Specification Sections; additional samples will be considered where performance or aesthetics of the work is considered as a crucial requirement by the Contractor where samples are not specifically required and as follows:

.1 Submit a complete and full range or multiple samples when variations in colour, pattern or texture is a natural occurrence of the materials being considered for use on the Project; reviewed and accepted samples will become the standard of workmanship and material against which installed work will be verified.
.2 Identify samples as follows:

.1 Name and project number.
.2 Date.
.3 Name of Contractor.
.4 Name of Subcontractor.
.5 Name of supplier/manufacturer and intended use of material represented by Sample.

.3 Do not proceed with fabrication or delivery of materials until Samples are reviewed; review of Samples does not indicate or imply in any way acceptance of finished Work.
.4 Work deemed, in the opinion of the Consultant, as being below the standard set by sample may, at the sole discretion of Consultant, be rejected; in such an event, Contractor shall replace all substandard with acceptable Work, at no additional cost to Owner.

.7 Mock-ups: Means all site erected work constructed and installed at locations acceptable to the Consultant using only specified materials and workmanship; Mock-ups are intended to exemplify finished Work and as follows:

.1 Reviewed and accepted mock-ups will become standards of workmanship and material against which installed work will be assessed.
.2 Mock-ups that are found acceptable by the Consultant may, at the sole discretion of the Consultant, form a part of the permanent work of the Project.
.3 Modified mock-ups will form the standard of acceptance for the remainder of the Project where modifications are required.
.4 Repair or replace mock-s as directed where mock-ups are deemed sub-standard or not acceptable.

.1 Required mock-ups are listed in Technical Specification Sections; some mock-ups may require several sections of work to cooperate and construct a complete assembly. Coordinate all activities of the relevant sections to ensure that required mock-ups are completed.

1.9 Regulatory Requirements

.1 Regulatory Requirements: Means all laws, by-laws, ordinances, rules, regulations, codes, orders of Authority Having Jurisdiction, and other legally enforceable requirements applicable to Work and that are or become in force during the performance of Work.

.2 The BC Building Code is considered the governing Building Code for the project.

.1 Certain design and performance requirements listed in the Specifications or indicated on the Drawings may exceed the minimum requirements established by the Building Code; all Products, Materials, components, systems, assemblies or other items having such requirements will be considered the minimum standard or performance requirements for the specified Product, Material, component, system, assembly or other item and will govern over the minimum requirements referenced in the Building Code.

.3 Contract Documents: Except in instances where Delegated Design criteria specified in Section 01 35 73 – Delegated Design Procedures require a professional engineer to design specific elements of construction, the Contractor shall not be responsible for verifying that Contract Documents comply with regulatory requirements and as follows:

.1 In the event that the Contract Documents are inconsistent with, or changes that require modification to Contract Documents are made to regulatory requirements by the Authority Having Jurisdiction, subsequent to date of Bid closing, Contractor shall immediately and without delay notify Consultant in writing and immediately request direction when a variance or change becomes known.

.2 Should Contractor fail to notify Consultant in writing and obtain the Owner's direction and performs Work knowing it to be contrary to regulatory requirements, Contractor shall be responsible for and shall correct all violations thereof and shall be liable for and bear costs, expenses, and damages attributable to failure to comply with all provisions of such regulatory requirements.

.3 The Owner reserves the right to make changes to the Contract Documents. Any resulting change in Contract Price or Contract Time will be made in accordance with General Conditions of Contract.

1.10 Permit Notices And Easements

.1 Easements and Notices: The Consultant on behalf of the Owner has obtained all required permanent easements and rights of servitude for the performance of the Work; Contractor is required to provide all notices required by regulatory requirements.

.2 Development Permit: The Consultant on behalf of the Owner has applied for, obtained, and paid for development permit.

.3 Building Permit: The Consultant, on behalf of the Owner, has applied and will be paying for the building permit. The Contractor is responsible for obtaining and coordinating all other permits required for Work and its various parts, and as follows:

.1 Contractor will require that specific Subcontractors pay for and obtain all permits required by the authorities having jurisdiction, where their Work is affected by Work requiring permits.

.2 The Contractor will display building permit and other permits in a conspicuous location at Place of Work.

.4 Occupancy Permits: The Contractor shall apply, pay for, and obtain, occupancy permits, including any partial occupancy permits required by the authority having jurisdiction and as follows:

.1 The Consultant will provide all appropriate instructions to the Contractor for correction to Work where Contract Document deficiencies are required to be corrected to obtain occupancy permits, including partial occupancy permits.
.2 The Contractor shall correct all deficiencies in accordance with the Consultant's instructions. In instances where a deficiency is not corrected, the Owner reserves the right to make all corrections and charge Contractor or, set off appropriate amounts for costs incurred to correct or otherwise remedy the deficiency against the Contract Price.
.3 Contractor will turn occupancy permits over to Owner after all Subcontractors have completed their portions of Work.

.5 Other Permits, Licenses, Certificates and Approvals: Except as otherwise specified, the Contractor shall apply, pay for, and obtain, all permits, licenses, certificates, and approvals required by regulatory requirements and the Contract Documents, based on the General Conditions of Contract and the following:

.1 Regulatory Requirements and fees in effect on date of Bid submission and,
.2 Any change in regulatory requirements or fees scheduled to become effective after date of Bid submission and for which public notice has been given prior to the date of Bid submission.

1.11 Quality Control

.1 Quality Assurance: All activities, actions, procedures, and all related activities performed prior to and during the Performance of the Work by the Contractor guarding against defects and deficiencies in materials and workmanship and, verifying that construction of the Project or any part thereof, is consistent with all regulatory requirements, qualification statements and certification requirements listed within the Contact Documents.

.2 Quality Control (Testing by Contractor): Testing, inspections, procedures, and all related activities performed by the Contractor during and subsequent to the Performance of the Work utilizing third party testing and inspection agencies to confirm that completed Work is in compliance with the specified standards and technical requirements listed within the Contract Documents; All such services are exclusive of all Construction Contract Administration duties, reviews and reporting performed by the Consultant, or any Quality Auditing Testing, inspections, procedures and activities performed by the Owner.

.3 Quality Audit (Testing by Owner): All Testing, inspections, procedures and related activities performed by the Owner during and subsequent to the Performance of the Work using a third party testing and inspection agencies to verify that the work being tested or inspected is in compliance with applicable standards and technical requirements listed within the Contract Documents, any applicable regulatory requirements and, are in addition to the Quality Control and Assurance procedures, programs or other QA/QC activates provided by the Contractor, or Construction Contract Administration duties, reviews and reporting performed by the Consultant.

.4 Responsibility for Quality Control: All required testing and inspection services are intended to confirm and verify the construction of the project or any part thereof, complies the requirements specified or indicated in the Contract Documents; All such testing, inspections, services, or other QA/QC activities do not relieve the Contractor from their responsibility to comply with all requirements of the Contract Documents:

.1 Specific quality control requirements for individual construction activities or parts thereof are specified in the individual technical sections that require all such activities.
.2 Specified tests, inspections, and related activities do not limit Contractor's and Subcontractors' own quality control procedures that facilitate compliance with the requirements identified within the Contract Documents.
.3 All requirements for Contractor to provide quality control services required by Consultant, Owner, or Authorities Having Jurisdiction are not limited by provisions of this section.

.5 Inspections and Testing: Individual Technical Specification Sections designate specific requirements for site quality control testing and inspection; all such requirements will be administered as follows:

.1 Owner Responsibilities: Where quality control services are indicated as the responsibility of the Owner, the Owner will hire or otherwise engage a testing or inspection agency, having sufficient qualifications and experience, to perform the required services:

.1 The Owner will provide the Contractor with names, addresses, and telephone numbers of all testing and inspection agencies employed or otherwise engaged by the Owner and, a description of the types of testing or inspection service they have been authorized to perform.

.2 Where tested or inspected Work fails to comply with regulatory requirements or the requirements of the Contract Documents; all costs for re-testing and re-inspection will be charged to the Contractor or responsible Subcontractors or all such amounts, as deemed appropriate by the Owner and the Consultant, will be set off from the Contract Price.

.3 Additional tests and inspections may be required by the Owner where additional tests are determined to be necessary to establish confirmation of performance.

.2 Contractor’s Responsibilities: Provide all quality control services specified or indicated in the Contract Documents or as required by the Authority Having Jurisdiction:

.1 Where services are indicated as the Contractor's responsibility, the Contractor shall engage or otherwise employ the services of a testing or inspection agency, having sufficient qualifications and experience to perform the required quality control services; Contractor shall not employ the services of the same entity engaged or otherwise employed by the Owner unless specifically agreed to in writing by the Owner.

.2 Where quality control services are indicated as the Owner’s responsibility, the Contractor will contact the Consultant and arrange with the Owner’s testing and inspection personnel to schedule performance of their Work at the proper time during the performance of the Work.

.3 Provide not less than five (5) working days notification to all testing and inspection agencies in advance of the time when work requiring testing or inspecting will be performed.

.4 Where quality control services are indicated as the Contractor's responsibility, the Contractor shall submit a certified written report, in duplicate, of each quality control service to the Owner, Contractor, and Consultant.

.5 Arrangement and payment for all Testing and inspections not required by the Contract Documents but, that have been requested by the Contractor or the Subcontractor remains the responsibility of the Contractor or that Subcontractor making all such requests.

.6 Submit copies of each written report directly to the Authority Having Jurisdiction when testing and inspections are required by the Authority Having Jurisdiction.

.3 Manufacturer's Site Services: Engage a factory authorized service representative to review and inspect all site assembled components and installation of equipment; submit written reports of findings or testing results to the Owner and the Consultant.

.4 Testing Agency Responsibilities: Provide qualified personnel to perform required tests and inspections. Coordinate and Cooperate with the Consultant and Contractor when performing all testing and inspections:

.1 Notify the Consultant and the Contractor promptly and without delay where irregularities or deficiencies are observed in the Work during performance of testing and inspection services.

.2 Interpret tests and inspections and clearly identify in each written report whether tested and inspected work complies with or deviates from the Contract Documents or any Regulatory Requirements.

.3 Prepare and submit a certified written report, in duplicate, of each test, inspection, and similar quality control service through the Contractor when tests are paid for by the Contractor, or to the Owner when paid for by the Owner.

.4 Do not release obligations, revoke, alter, or increase requirements of the Contract Documents, approve, or accept constructed Work or any portion thereof.
.5 Do not perform any duties of the Contractor.

.5 Related Services: Cooperate with agencies performing required tests, inspections, and similar quality control services, and provide reasonable supplementary supportive services as requested and as follows:

.1 Provide adequate advance notification to the testing and inspection agency to permit assignment of personnel.
.2 Provide clear, unobstructed safe and adequate access to the Work.
.3 Provide all incidental labour and facilities as necessary to facilitate tests and inspections.
.4 Provide adequate quantities of representative samples of materials that require testing and inspecting.
.5 Assist the agency in obtaining all required samples.
.6 Provide suitable and adequate facilities for storage and site curing of testing of samples
.7 Preliminary design mix proposed for use for material mixes that require control by testing agency
.8 Maintain security and protection for samples and for testing and inspecting equipment at project site.

.6 Repair: Repair all damaged construction and restore substrates, finishes and all other affected Work upon completion of testing, inspecting, sample taking, and similar services:

.1 Protect construction exposed by, or for quality control service activities.
.2 All repairs and protection remain the responsibility of the Contractor regardless of obligation of responsibility for quality control services.

.6 Correction and Remediation of Rejected Work: Remove all defective Work resulting from poor workmanship, use of defective Products or damage; whether incorporated into the Work or not, which have been rejected, indicated as un-satisfactory or failing to conform to the Contract Documents by the Consultant and as follows:

.1 The Contractor shall at no additional cost to the Owner:

.1 Replace or re-execute in accordance with originally specified performance requirements.
.2 Repair, replace or otherwise correct all other work damaged by such repairs, removals, or replacements promptly and to the satisfaction of the Consultant.
.3 Owner may set off from the Contract Price the difference in value between the Work performed which as required by the Contract Documents; all amounts as determined by the Consultant, where corrective work is not performed within a reasonable time frame to repair rejected or unsatisfactory Work, or al such Work that is not performed in accordance with the Contract Documents and regulatory requirements.

1.12 Construction Site Safety Requirements

.1 Site Safety: The Contractor for the purposes of the Occupational Health and Safety Act, this Contract and for the duration of the Work, is hereby identified as the “Prime Contractor” and acknowledges and agrees to the following:

.1 Be the “Prime Contractor” for the “Work Site”, and
.2 Meet all requirements of the Occupational Health and Safety Act and Regulations, Workers Compensation Board, the Fire Code, and all-other applicable laws, by laws, regulations, guidelines, and recommendations the govern workplace safety.

.3 Be responsible for direction of all Subcontractors, sub-subcontractors, Other Contractors, employees, suppliers, workers and any other persons at the “Work Site” on safety related matters to the extent required to fulfill it “Prime Contractor” duties and responsibilities in accordance with the Occupational Health and Safety Act regardless of Whether or not any contractual relationship exists between the Contractor and any of these entities, and whether or not such entities have been specifically identified in this Contract.

.4 Safety Certification: Safety certification is a condition of contract award; Contractor is required to maintain a valid Certificate of Recognition (COR) for the duration of the Work of this Contract; Contractor will coordinate COR requirements with Subcontractors affected by Provincial regulation.

.2 Owner’s Safety Representative: The Owner will provide a complete list of their safety personnel to the Contractor at the Project start up meeting or, within fifteen (15) working days of such meeting and may at any time during the Performance of the Work appoint additional personnel to attend site safety meetings and conduct site safety reviews.

.3 The Owner may, at their sole discretion, and at any time during the Performance of the Work, appoint additional personnel to attend site safety meetings and conduct site safety reviews.

1.13 Temporary Facilities And Controls

.1 This Section includes supply, installation and payment requirements for all temporary facilities and controls, including but not limited to, temporary utilities, support facilities, security, and protection facilities.

.2 Temporary utilities include the following:

.1 Sewers and drainage.
.2 Water service and distribution.
.3 Sanitary facilities, including toilets, wash facilities, and drinking water facilities.
.4 Heating and cooling facilities.
.5 Ventilation.
.6 Electric power service.
.7 Lighting.

.3 Support facilities include the following:

.1 Temporary roads and paving.
.2 Dewatering facilities and drains.
.3 Temporary signs.
.4 Waste disposal facilities.
.5 Site offices.
.6 Storage and fabrication sheds.
.7 Lifts and hoists.
.8 Construction aids and miscellaneous services and facilities.

.4 Security and protection facilities include the following:

.1 Environmental protection.
.2 Temporary enclosures.
.3 Dust tight screens.
.4 Storm water, erosion, and sedimentation controls.
.5 Tree and plant protection.
.6 Site enclosure fence.
.7 Security enclosure and lockup.
.8 Barricades, warning signs, and lights.
.9 Covered walkways.
.10 Fire protection.

1.14 Utilities And Usage Charges

.1 Cost or use charges for all temporary facilities are not chargeable to the Owner or Consultant and are to be included in the Contract Price.

.2 The Contractor shall allow other entities and personnel to use temporary services without cost, including, but not limited to the following:

.1 The Owner.
.2 The Owner's construction forces.
.3 Occupants of Project.
.4 The Consultant.
.5 Testing and Inspection agencies.
.6 Personnel of authorities having jurisdiction.
.7 Other Personnel as identified by the Owner.

.3 Pay all sewer service use charges, for usage by all parties engaged in the Performance of the Work, at Project site.

.1 Water: Pay water service use charges, whether metered or otherwise, for all water used for construction activities at Project site.
.2 The Contractor is responsible for all connections, disconnections, service lines, valves, and similar materials required to provide service, The Contractor is also responsible to pay for removal of all such service connections lines, valves, and similar materials upon completion of the Work in accordance with governing regulations and ordinances.
.3 Restore permanent Work to same condition as surrounding materials after removal of temporary connections and service lines.

.4 Electricity: Pay electric power service use charges, whether metered or otherwise, for electricity used for construction activities at Project site:

.1 The Contractor is responsible for all connections, disconnections, service lines, valves, and similar materials required to provide service, Contractor is also responsible to pay for removal of all such service connections lines, valves, and similar materials upon completion of the Work in accordance with governing regulations and ordinances.
.2 Restore permanent Work to same condition as surrounding materials after removal of temporary connections and service lines.
.3 Temporary electrical service shall be adequate for Elevator testing and operation when required.
.4 Contractor shall arrange for electricity, suitable for operation of tools and temporary lighting.
.5 Contractor will provide temporary lighting as required to ensure a safe worksite and provide additional site lighting for individual tasks as required by the technical sections.

.5 Sanitary Facilities: Provide and maintain during the work, temporary toilets for the use of all workmen employed on the work. Toilets in the finished portion of the building shall not be used by workers. In accordance with the Provincial Board of Health Regulations under the Public Health Act. Provide separate facilities for both sexes as required:

.1 Provide toilet tissue, paper towels, paper cups, and similar disposable materials for each facility. Maintain adequate supply. Provide covered waste containers for disposal of used material.

.6 Temporary Heating: Make provision for heating the building during its erection and until date of Substantial Performance:

.1 Ensure temporary heating system will maintain a minimum temperature of 16°C (60°F) within the building enclosure from shell construction to completion of the interior work, or higher as indicated in the technical sections.

.2 Use of gasoline burning space heaters, open flame heaters, salamander type or other direct fired heating units is prohibited.
.3 Pay all costs for temporary heating up to the date of Substantial Performance.
.4 The cost of any boilers, chimneys, pumps, piping, valves, heaters, radiators, etc., necessary for a temporary hook up shall be the responsibility of the by the Contractor.
.5 Any portion of the building's heating or ventilating system used by the Contractor shall be restored to "new" condition, placed in permanent positions as indicated on Drawings.
.6 Warranty period on equipment used temporarily shall commence on date of Substantial Performance.

.7 Contractor will bear costs of all temporary services required for the project in excess of those, available from existing services, supplied by the Owner.

1.15 Temporary Facilities Design

.1 Design Requirements: The Contractor is responsible for the design and safety of all temporary facilities:

.1 Temporary facilities of where engineering expertise is required for their design to ensure safety during construction shall be designed by a professional engineer in the employ of the Contractor and who is registered in the Province of the Place of Work.
.2 Before the temporary structure is used, the engineer responsible for the design or their representative shall review, inspect the structure, and issue a certificate clearly indicating and certifying that it has been constructed according to the engineer’s design.
.3 Submit all such certificates, reports, and other informational documentation to the Consultant in accordance with the submittal procedures outlined in this Section.

.2 Overloading of Structures: Take precautions to prevent any part the structure from being loaded with a load greater than its calculated bearing capacity until completion of construction:

.1 Confine apparatus, storage of Products, and operations of employees to limits indicated by laws, ordinances, permits or the Contract Documents and that do not unreasonably encumber the premises with Products.
.2 Make every temporary support as strong as permanent support.
.3 Do not place load on concrete floors until they have obtained their permanent set and Consultant's authorization has been received.

.3 Temporary Facility Requirements: Provide hoists, cranes and moving equipment, and shoring and bracing required for hoisting, lifting, and moving equipment and materials required for the project into final position within the structure and as follows:

.1 Notify affected Subcontractors and coordinate placement of hoisting, lifting, and moving equipment, and shoring and bracings.
.2 Provide qualified personnel to operate and erect hoists, cranes and moving equipment, and shoring and bracing.
.3 Provide qualified engineer where site engineering is required to inspect and supervise erection procedures.

.4 Notification Requirements: Prepare risk control plan and engineered lift study for any equipment or material movements that have the potential to overload the structure, adjacent buildings, and structures, or affect occupant safety and as follows:

.1 Notify the Consultant of engineered erection procedures for hoisting, lifting, and moving equipment, and shoring and bracings.
.2 Prepare risk control plan and engineered lift study before equipment and materials requiring detailed erection procedures sufficiently in advance of when they are scheduled to arrive on site to allow for Consultant’s review.
.3 Submit risk control plan and engineered lift study to the Consultant as an Informational Submittal as described in this Section.

.5 Installation and Execution Requirements:

.1 Installer of each permanent service shall assume responsibility for operation, maintenance, and protection of each permanent service during its use as a construction facility before Owner's acceptance, regardless of previously assigned responsibilities.
.2 Keep temporary services and facilities clean and neat.
.3 Relocate temporary services and facilities as required by progress of the Work.
.4 Provide new materials; undamaged, previously used materials in serviceable condition may be used if approved by Consultant. Provide materials suitable for use intended.
.5 Locate facilities where they will serve Project adequately and result in minimum interference with performance of the Work. Relocate and modify facilities as required.
.6 Provide each facility ready for use when needed to avoid delay. Maintain and modify as required. Do not remove until facilities are no longer needed or are replaced by authorized use of completed permanent facilities.
.7 Engage appropriate local utility company to install temporary service or connect to existing service:

.1 Where utility company provides only part of the service, provide the remainder with matching, compatible materials, and equipment.
.2 In accordance with utility company recommendations.
.3 Arrange with utility company, Owner, and existing users for time when service can be interrupted, if necessary, to make connections for temporary services.
.4 Provide adequate capacity at each stage of construction, provide trucked in services where temporary utility is not available.
.5 Obtain easements to bring temporary utilities to Project site where Owner's easements cannot be used for that purpose.

.8 Install and maintain temporary fire protection facilities of types needed to protect against reasonably predictable and controllable fire losses until permanent facilities are complete and operational.
.9 In accordance with requirements of authorities having jurisdiction and NFPA 241, Standard for Safeguarding Construction, Alteration, and Demolition Operations.
.10 Provide fire extinguishers, installed on walls on mounting brackets, visible and accessible from space being served, with sign mounted above including, but not limited to the following:

.1 Site Offices: Class A stored pressure water type extinguishers.
.2 Other Locations: Class BCBC dry chemical extinguishers or a combination of extinguishers of NFPA recommended classes for exposures.
.3 Locate fire extinguishers where convenient and effective for their intended purpose; provide not less than one extinguisher on each floor at or near each usable stairwell.

.11 Store combustible materials in suitable containers in fire safe locations.
.12 Maintain unobstructed access to fire extinguishers, fire hydrants, temporary fire protection facilities, stairways, and other access routes for firefighting. Prohibit smoking in hazardous fire exposure areas.
.13 Supervise welding operations, combustion type temporary heating units, and similar sources of fire ignition and provide a fire watch of not less than two (2) hours after completion of all welding, torch cutting and all other hot works.
.14 Develop and supervise an overall fire prevention and first aid fire protection program for personnel at Project site. Review needs with local fire department and establish procedures to be followed. Instruct personnel in methods and procedures. Post warnings and information.
.15 Provide hoses for fire protection of sufficient length to reach construction areas. Hang hoses with a warning sign stating that hoses are for fire protection purposes only and are not to be removed. Match hose size with outlet size and equip with suitable nozzles.
.16 Provide temporary standpipes and hoses for fire protection. Hang hoses with a warning sign stating that hoses are for fire protection purposes only and are not to be removed. Match hose size with outlet size and equip with suitable nozzles.

1.16 Temporary Project Signage

.1 Comply with all applicable Provincial, Municipal, and Local regulations in relation to permitting for signs and location of Project signs in close proximity to all highways and on rights-of-way.

.2 Provide temporary on-site warning, traffic directing, and all other informational signage as required by the appropriate regulatory requirements and as may be requested by the Authority Having Jurisdiction.

1.17 Common Product Requirements

.1 Product and Material Quality: Provide and pay for all labour, Products, tools, machinery and equipment, water, heat, light, power, transportation and all other facilities and services necessary for the performance of the Work and as follows:

.1 Provide only new Products unless otherwise specified in the Contract Documents.
.2 Unspecified Products and materials shall be of a quality best suited to the intended purpose; their use on the Project is subject to the approval of the Consultant.
.3 Storage, Handling and Protection: Handle and store all Products and materials in such a manner as to prevent damage, contamination, deterioration, and soiling and as follows:

.1 Comply with the manufacturer's instructions.
.2 Store packaged or bundled Products in original and undamaged condition with all manufacturer's seals and labels intact.
.3 Protect and store all Products and materials subject to damage from weather in weatherproof enclosures

.4 Manufacturer's Instructions: Install or erect all Products and materials in accordance with manufacturer's written instructions and as modified by Technical Specifications Sections; do not rely solely on labels or enclosures provided with Products and materials; obtain written instructions directly from manufacturers and as follows:

.1 The Contractor shall notify the Consultant in writing of any discrepancies between the specifications and manufacturer's written instructions; the Consultant will establish the course of action and, once determined the Consultant will issue the appropriate project documentation to instruct the Contractor.
.2 Improper installation or erection of Products due to failure to comply with these requirements authorizes the Consultant to require removal and reinstallation at no increase in Contract Price.

.5 Workmanship: Provide workmanship of the best quality; executed by workers experienced and skilled in their respective duties for which they are employed and as follows:

.1 Do not employ any unfit person or anyone not having the appropriate requisite training and skill required to perform their duties.
.2 Decisions as to the quality or fitness of workmanship in cases of dispute rest solely with the Consultant, whose decision is final.

.6 Concealment: Conceal pipes, ducts and wiring in finished areas within floors, walls, and ceilings, except indicated as being exposed as an architectural element; do not conceal or cover pipes, ducts, conduit wire or all other elements scheduled to be concealed by final construction prior to all reviews, testing and inspections have been completed and approved by the appropriate party.

1.18 Execution Requirements

.1 Hours of Work: Hours of Work on site are 07:00 hours to 18:00 hours, local time, Monday through Friday, and as follows:

.1 Review hours of work with Owner
.2 Conduct all work during normal operating hours in a manner that does disrupt Owner’s normal operations

.3 Arrangements for extended hours for any Work required to be completed on Saturdays, Sundays or statutory holidays must be pre-arranged in writing with the Owner's representative through the Consultant.

.4 Unless directed specifically by the Owner. No additional compensation will be paid by the Owner for overtime work where scheduling requires work to be completed on weekends, evenings, or nights.

.5 Occupancy by Owner: Owner reserves the right to occupy the building and site for installation of equipment and storage of supplies at any time prior to date of Substantial Performance:

.1 Such possession or use thereof shall not be construed as final acceptance of the project or any portion thereof.

.2 Contractor provide and maintain full services such as heat, light, water, and similar services between time of occupancy by Owner, to date of Substantial Performance of the Work, at no cost to Owner.

.6 Smoking Policy: Facility is a smoke free environment; no one will be allowed to smoke anywhere on site; both inside and outside of buildings except in area as directed by the Contractor; keep designated smoking areas clean and sanitary, do not permit butts to accumulate or enter the watershed.

.7 Food and Drink Policy: Food and drink consumption by construction forces will only be permitted within areas designated by Contractor; keep designated eating areas clean and sanitary; use closed waste receptacles and remove trash daily.

.8 Installation: Locate the Products, materials, and all other components of the Work accurately, in correct alignment and elevation as indicated and as follows:

.1 Make all vertical work plumb and make horizontal work level.

.2 Where space is limited, install components to maximize space available for maintenance and ease of removal for replacement.

.3 Conceal pipes, ducts, and wiring in finished areas, unless indicated specifically as being exposed as architectural features:

- In rooms or areas having no finished ceiling; pipes, conduits and ducts will generally be left exposed, except where indicated on the Mechanical drawings as built into walls or behind furring. Electrical conduit and fittings shall be built into walls.
- In the event of conflicts occurring between equipment shown in concealed areas, observe the following order of priority:
  - Structural elements.
  - Plumbing drains.
  - Sprinkler piping.
  - Ductwork.
  - Heating piping.
  - Plumbing piping.
  - Electrical conduit.
- Do not conceal or cover pipes, ducts, conduit wire or all other elements scheduled to be concealed by final construction prior to all reviews, testing and inspections have been completed and approved by the appropriate party.
- Maintain minimum headroom clearance of 2440 mm in spaces without a suspended ceiling.

.4 Inform the Consultant of impending installation of fixtures, switches and attachments and confirm actual locations prior to final installation:

- Location of fixtures, apparatus or outlets shown or specified shall be considered as approximate only. The actual location shall be as directed and required to suit conditions at the time of installation as defined by Consultant.
- Locations noted on drawings are diagrammatic only.
- Note furring requirements and limitations shown on the drawings.
- Make allowance for the possibility that indications and locations shown on mechanical and electrical drawings are diagrammatic.

- Inform the Consultant before any masonry, concrete forming, or installation work is carried out where the Contractor determines that furring allowances described above cannot be obtained.

.5 Inform the Consultant before proceeding with the work where the location of holes in the structure could affect the nature or strength of the structure.

1.19 Cutting And Patching

.1 Approvals: Submit written requests not less than ten (10) working days in advance of cutting or alteration which affects the following:

.1 Structural integrity of any element of the Project.
.2 Integrity of weather exposed or moisture resistant elements.
.3 Efficiency, maintenance, or safety of any operational element.
.4 Visual qualities of sight exposed elements.
.5 Work of Owner or another Contractor.

.2 Inspection: Inspect existing conditions, including elements which may be subject to damage or movement during cutting and patching:

.1 After uncovering, review and inspect conditions affecting performance of Work.
.2 Beginning of cutting or patching means acceptance of existing conditions
.3 Provide an Owner pre-approved non-destructive testing method to determine locations of existing services in existing concrete slabs before cutting and renovations.

.3 Perform all cutting, fitting, and patching including excavations and fill, to complete the Work and as follows:

.1 Remove and replace all defective and non-conforming Work.
.2 Provide openings in non-structural elements of Work for penetrations of mechanical and electrical work. Where non-structural elements are fire resistance rated all penetrations must be sealed using an appropriate firestopping material and installation method and in accordance with Division 07.
.3 Perform all Work in a manner and sequence as to avoid damage to other Work.
.4 Properly prepare surfaces to receive patching and finishing.
.5 Cut rigid materials using power saw or core drill. Pneumatic or impact type cutting tools are not permitted
.6 Restore Work with new products in accordance with Contract Documents.
.7 Fit work tight to pipes, sleeves, ducts, conduit, and other penetrations through surfaces; allow for expansion and contraction of materials; install sealants and firestop per requirements of the technical specifications, and drawings.
.8 At penetration of fire rated wall, ceiling, or floor construction, completely seal voids with fire rated material, full thickness of the construction element.
.9 Refinish surfaces to match adjacent finishes; for continuous surfaces refinish to nearest intersection. For an assembly, refinish entire unit.

1.20 Anchors And Fasteners

.1 Fastenings: Provide metal fastenings and accessories in same texture, colour and finish as adjacent materials, and as follows:

.1 Prevent galvanic corrosion between dissimilar metals and materials.
.2 Use non-corrosive hot dip galvanized steel fasteners and anchors for securing exterior work, unless stainless steel or other material is specifically requested in affected specification Section.
.3 Space anchors within individual load limit or shear capacity and ensure they provide positive permanent anchorage. Wood, or any other organic material plugs are not acceptable; coordinate design of fastenings and anchors with requirements listed below.

.1 Keep exposed fastenings to a minimum, space evenly and install neatly.

.2 Fastenings which cause spalling or cracking of material to which anchorage is made are not acceptable.
.3 Fixings to concrete decks: Do not pierce roof slabs.
.4 Fixings to steel decks from below: Do not pierce top flutes.

.4 Equipment Fastenings: Use fastenings of standard commercial sizes and patterns with material and finish suitable for service, and as follows:

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

.5 Provide anchors and fasteners as required to anchor each component securely in place, accurately located and aligned with other portions of the Work:

.1 Mount components at heights directed by Consultant where mounting heights are not indicated.
.2 Allow for building movement, including thermal expansion and contraction.

.6 Anchors for systems, pipes, conduits and equipment, hangers and support systems, and connections to building structure shall be the responsibility of the installing Subcontractor; installing Subcontractor shall retain a professional engineer registered in Province of the Work to review/design anchor installation to ensure that all anchors and attachments to the structure are suitable for the purposes intended, properly installed, including those where installation deviates from design data and standards published by anchor and hanger support manufacturers:

.1 Submit proof of load carrying capacity for standard anchors and hanger supports used in construction when requested by the Consultant or Contractor.

.2 Powder Actuated Tools are not permitted on site without prior approval of the Consultant; comply with requirements of the local Occupational Health and Safety Act, General Safety Regulations when powder actuated tools are used.

1.21 Cleaning

.1 Individual Subcontractors will be responsible for daily cleaning under the Contractor's cleaning program. Subcontractors will provide employees for general clean-up as directed by the Contractor.

.2 Clean Project site and work areas daily, including common areas. Coordinate progress cleaning for joint use areas where more than one installer has worked. Enforce requirements strictly. Dispose of materials lawfully:

.1 Comply with requirements identified in NFPA 241 for removal of combustible waste materials and debris.
.2 Do not hold materials in excess of seven (7) calendar days during normal weather or three (3) calendar days should the temperature be anticipated to rise above 25°C.
.3 Use appropriate sealable containers for all hazardous, odorous, and unsanitary waste materials separately from all other waste. Clearly mark and identify containers appropriately and dispose of legally, lawfully and in accordance with all Codes, Laws, By-laws, regulations, and guidelines applicable the Province, City, or municipality of the Work.

.3 Maintain Project site free of waste materials and debris.

.4 Clean and maintain all areas where work is in progress to the level of cleanliness necessary for proper execution of the Work and for safety of all personnel in the area:

.1 Remove liquid spills immediately using suitable techniques, materials, and containers.
.2 Vacuum the entire work area, as appropriate, where dust impairs proper execution of the Work.

.5 Keep installed work neat tidy and clean.

.6 Clean all newly constructed and finished surfaces in accordance with the manufacturer's written instruction and recommendations, using only cleaning materials specifically recommended. If specific cleaning materials are not recommended, use cleaning materials and products that are not hazardous to health or property, and that will not damage exposed or finished surfaces.

.7 Remove all debris and dust from concealed spaces before enclosing the space.

.8 Protect all finished surfaces from damage and deterioration as necessary from completion of installation up to and including the date of acceptance of Substantial Performance of the Work.

.9 Clean all areas and spaces where cutting and patching are performed; completely remove paint, mortar, oils, putty, and similar materials:

.1 Thoroughly clean piping, conduit, and similar features before applying paint or other finishing materials. Restore damaged pipe covering to its original condition.

.10 Burning or burying of waste materials on site will not be permitted.

.11 Washing, pouring, or otherwise disposing of waste materials into sewers or waterways will not be permitted.

.12 Clean and protect all construction completed or, in progress and all adjoining materials already in place during handling and installation. Apply protective coverings where required to ensure protection from damage or deterioration until the date of acceptance of Substantial Performance of the Work.

.13 Where operable products, equipment, components, or other items intended to remain as a permanent part of the Construction of the project and, are used by the Contractor for performance of the work at the place of work; the Contractor shall clean and provide regular maintenance on all completed construction as frequently as necessary through the remainder of the construction period. Adjust and lubricate operable components to ensure operability without damaging effects.

.14 Contractor will supervise all construction operations to assure that no part of the construction; completed or in progress, is subject to harmful, dangerous, damaging, or otherwise deleterious exposure during the construction period.

1.22 Project Closeout

.1 Starting, Testing, Adjusting and Balancing (STAB): Coordinate requirements for STAB requirements for installed equipment with requirements of Mechanical and Electrical Divisions; implement a STAB program generally consisting of the following:

.1 Start equipment and operating components to confirm proper operation
.2 Remove malfunctioning units, replace with new units, and retest
.3 Adjust operating components for proper operation without binding
.4 Adjust equipment for proper operation
.5 Test each piece of equipment to verify proper operation
.6 Test and adjust controls and safeties
.7 Replace damaged and malfunctioning controls and equipment
.8 Comply with qualification requirements for Quality Control listed earlier in this Section where a factory authorized service representative is required to inspect site assembled components and equipment installation.

.2 Systems Demonstration: Demonstrate operation of each system to Owner before requesting final inspection and applying for Substantial Performance:

.1 Instruct personnel in operation, adjustment and maintenance of equipment and systems, using provided operation and maintenance data as the basis for instruction.
.2 Also refer to Mechanical and Electrical requirements for specific requirements for the following:

.1 Equipment start-up
.2 Fire alarm verification
.3 Additional items identified in Technical Specification Sections

.3 Closeout Procedures: Collect reviewed submittals and assemble documents executed by Subcontractor's, suppliers and manufacturers as required below before final Application for Payment and as follows:

.1 Execute transition of Performance and Labour and Materials Payment Bond to Warranty Period requirements.
.2 Submit a final statement of accounting giving total adjusted Contract Price, previous payments, and monies remaining due.
.3 Consultant will issue a final change order reflecting approved adjustments to Contract Price not previously made.

.4 Takeover Procedures: Carefully review and inspect the Work; ensure it is complete before making application for certificate of Substantial Performance; confirm that all construction deficiencies are complete and, all defects are corrected or otherwise remedied and, that the building is clean, neat, and tidy condition suitable for occupancy and as follows:

.1 Immediately notify the Consultant in writing, of satisfactory completion of the Work and request a final review and confirmation that all Work is ready for takeover by Owner.
.2 The Consultant will very Contractor's deficiencies and defects lists if any exist that will require corrective action by the Contractor.
.3 Contractor may make application for a certificate of Substantial Performance when, in the Consultant's opinion, all deficiencies and defects have been corrected, replaced, or otherwise remedied and appear to meet the requirements of the Contract Documentation.

1.23 Closeout Submissions

.1 Operation and Maintenance Data: Provide a complete, organized compilation of operating and maintenance data including detailed technical information, documents and records describing the operation and maintenance requirements and procedures of individual Products or systems as specified in the technical sections and as follows:

.1 Binders: "D" ring type, heavy duty vinyl binders having clear plastic pockets on the spine and front cover for project information inserts; limited to a maximum of 75 mm spine width and no more than 2/3 full.
.2 Binder Colours:

.1 Architectural: Black
.2 Structural: Yellow
.3 Mechanical: Green
.4 Electrical: Royal Blue
.5 Shop Drawings: Red

.3 Quantity:

.1 Final Electronic Version: Provide one (1) copy of manufacturer's maintenance manuals and operational schematics scanned or native format PDF saved on USB Flash Drive.
.2 Final Paper Version: Provide one (1) copy of manufacturer's maintenance manuals and operational schematics, bound as specified above in this Section.

.4 Content: Coordinate all requirements with specific requirements contained in the Technical Specifications required; include cover sheets identifying:

.1 Date submitted.
.2 Project title, location, and project number.

.3 Names and addresses of Contractor and all Subcontractors.
.4 Table of Contents of all binder volumes and disciplines
.5 List of warranties and guaranties for the project
.6 List of approvals and certificates for the project

.5 Material, Product or System Data: Include the following listing of information for each individual tab within the Operation and Maintenance Manuals:

.1 Tab Contents: Include vendor name, and equipment make, model and serial number
.2 Spare parts lists: Source of spare parts for materials that are not kept at site; list of spare parts that are required to be kept at site
.3 Warranty or Guaranty information and claim procedure specific to material, Product, or system.

.6 Operation Data: Description of each system and its controls and as follows:

.1 Control schematics for each system including environmental controls
.2 Description of operation of each system at various loads together with reset schedules and seasonal variances
.3 Operation instruction for each system and each component
.4 Description of actions to be taken in event of equipment failure

.7 Maintenance Data: Servicing, maintenance, operation and troubleshooting instructions for each item of equipment and as follows:

.1 Maintenance schedules with tasks and frequencies including listing of tools required to complete maintenance and estimated task time

.8 Performance Data: Equipment manufacturer's performance data sheets with point of operation as left after facility systematic testing and balancing was completed including the following:

.1 Equipment performance verification test results.
.2 Special performance data as specified in individual Technical Specification Sections.

.2 Maintenance Materials: Provide additional materials prior to completion of Work in accordance with technical specifications.

.1 Spare Parts: Provide spare parts prior to completion of the work as indicated below and in various specification sections:

.1 Mechanical spare parts and maintenance materials: as indicated in Mechanical Divisions.
.2 Electrical spare parts and maintenance materials: as indicated in Electrical Divisions.

.3 Deficiency List: Contractor and all Subcontractors shall conduct an inspection of the Work, identify deficiencies and defects and repair these as required to conform to the Contract Documents.

.1 Prepare a list of incomplete items and submit electronic copy of list to Consultant prior to declaring Substantial Performance. Include name and identification of each space and area affected by construction operations for incomplete items and items needing correction including, if necessary, areas disturbed that are outside the limits of construction:

.1 Organize list of spaces in sequential order, starting with exterior areas first and proceeding from lowest floor to highest floor.
.2 Organize items applying to each space by major element, including categories for ceiling, individual walls, floors, equipment, and building systems.
.3 Include the following information at the top of each page:

- Project name.
- Date.
- Name of Owner.

- Name of Consultant.
- Name of Contractor.
- Page number.

.4 Include value of items on the list, and reasons why the item of work is incomplete or deficient.

.5 Include space for Consultant's verification check and any additional items that the Consultant may add during preliminary review.

.6 Include space for Contractor's Correction or Completion Date.

.2 Record Documents: Record documents will consist of a hard copy of the Project Manual (Specification) and Drawings and will be used to record deviations, variations, and other project specific information accurately and neatly from the Contract Documents caused by or due to site conditions and change orders as follows:

.1 Record locations of all concealed components of mechanical and electrical services

.2 Clearly identify drawings used to record all such information as "Project Record Copy".

.3 Maintain site record documentation in an undamaged condition free form all dirt, coffee, and other deleterious materials; make all such documentation available on site for review by the Owner and the Consultant.

.4 Submit all record documents to the Consultant upon completion of the Work and prior to final review

.5 The Consultant will review the record drawings in print form and when accepted, the Consultant will arrange with the Owner to incorporate architectural, structural, mechanical, and electrical deviations noted on record documents.

2. PRODUCTS

2.1 Not Used

3. EXECUTION

3.1 Not Used

END OF SECTION

1. GENERAL

1.1 Summary

.1 Provide alteration project procedures in accordance with requirements of the Contract Documents.

1.2 Definitions

.1 Cutting: Means removal of existing construction necessary to permit installation or performance of other Work.

.2 Make Good/Patch/Repair: Means to identify defective or damaged locations, properly prepare identified locations for repairs, and repair (including substrates) using new materials to match construction and finish of adjacent sound locations; blend repaired area smoothly with adjacent construction so that it is not distinguishable from untreated areas in performance or appearance.

1.3 Administrative Requirements

.1 Access: Access by public to specific areas under construction will not be permitted; public and Owners access to other areas must be maintained at all times and as follows:

.1 Provide and maintain temporary fire exit routing. Maintain clear of obstructions during full extent of Contract.
.2 Subcontractors' access to Work shall be as later agreed by Owner, Contractor, and Consultant.
.3 Subcontractors shall not use any facilities in existing building such as washrooms, elevator, and similar public convenience facilities without Owner's approval.

.2 Temporary Use of Exits: Contractor shall make arrangements with Owner to use existing stairs for access to construction and renovation Work:

.1 Required exits and exit ways shall be maintained at all times and Owner's personnel will be permitted to use stair at any time.
.2 Protect access ways from damage during Construction. Cover wall, floor and stair surfaces with polyethylene film and cover with plywood or matting to prevent staining and scaring of existing finishes. Restore damage to condition equal to that prior to damage.
.3 Provide temporary partitioning or enclosures to maintain or extend emergency and fire exits when required.
.4 Provide and maintain all necessary overhead protection in public areas during progress of Work.

.3 Scheduling: Schedules for requirements as follows:

.1 Schedule Work and sequence operations in cooperation with Owner and Consultant. Work shall proceed in strict accordance with agreed upon and approved schedule.
.2 Utility and service interruptions shall be kept to a minimum and will be permitted only with written permission of Owner; make requests for service interruptions at least seven (7) days before proposed date; state number of hours of interruption and confirm date and time forty eight (48) hours in advance of interruption.
.3 Provide two (2) weeks advance notice of entering existing area of Work; confirm forty eight (48) hours in advance of starting date.
.4 Contractor shall request written confirmation from Owner that scheduled areas of Work do not contain any equipment or furnishings that Owner intends to salvage, prior to demolition.

.4 Responsibility and Assignment to Trades: Contractor shall assign Work of moving, removal, cutting, patching and repair to experienced and knowledgeable Subcontractors so as to cause least damage to each type of Work encountered, and so as to return building as much as possible to appearance of new Work:

.1 Patching of finish materials shall be assigned to Subcontractors skilled in Work of finish trade involved.

.2 Coordinate patching requirements with Section 01 73 29 – Cutting and Patching.

.5 Coordination of Work and Noise Levels: Coordinate Owner through Consultant activities having excessive noise levels or vibration or that are detrimental to ongoing operation of existing building complex, an alternate time for such Work shall be scheduled through Consultant:

.1 Notify Consultant prior to commencing any Work that will cause undue noise or vibration.
.2 Obtain permission from Consultant prior to drilling holes or cutting chases or openings in floors or ceilings, columns or walls.

.6 Work Areas: Limits of Work are as indicated on drawings; work and operation of machinery, storage of equipment, and materials and/or supplies, must be contained within areas under construction and as follows:

.1 All damage caused to existing roads, lanes, paving, curbs, buildings, and equipment due to Work of this Contract, but not called for as Work under this Contract, shall be made good by Contractor at no additional cost to Owner.
.2 Contact Owner's representative and arrange for sign in/sign out procedure with authorized personnel to obtain keys as required, if Contractor requires access to locked areas during construction; Return keys at end of Work period.
.3 Contractor shall post boundaries of working areas with suitable signs, warning his forces, that areas outside of designated Work area are out of bounds to personnel and equipment. These signs are to remain in place at all times during construction.
.4 Existing protected areas and other areas outside limits of Work area are out of bounds to personnel and equipment. These areas are not to be used for any other purpose.
.5 If revision to limits of working area becomes necessary for any compelling reason, contact Consultant immediately and do not disturb additional area without authorization from Consultant.

1.4 Quality Assurance

.1 Regulatory Requirements: Conform to Building Code, Provincial Occupational Health and Safety Act, and other applicable standards and regulations required by the Authority Having Jurisdiction including; but not limited to, the following:

.1 All electrical equipment and fixtures shall be CSA approved and carry appropriate CSA label.
.2 Use welders certified in accordance with CSA W47, and conforming to CSA W59 for structural steel work.

.2 Qualifications: Provide proof of qualifications when requested by Consultant:

.1 Matching Existing Materials: All Work performed and materials used in existing building shall be of same standard of quality as that of existing finished building as a minimum.
.2 Roof Patching: Make all patching, repairs, cutting, infill, and curb and flashings for new roof penetrations and openings shall be in accordance with RCABC Manual on Good Roofing Practice and Accepted Roofing Systems, using materials that are compatible with existing roof assembly.
.3 Fire Safety: Provide strict safety measures for welding in existing building. Provide and maintain a fully charged 9.5 kg CO_2 fire extinguisher within view and easy access of welding Work at all times.

1.5 Site Conditions

.1 Ambient Conditions: Maintain interior temperature and humidity of remainder of building during full extent of construction by installing insulated dust and weather tight non-combustible temporary partitioning as specified in Section 01 00 10 – General Requirements: Temporary Facilities.

.2 Existing Conditions: Seal off ducts, louvers, vents, openings, or ceiling spaces between construction area and remainder of building to prevent dust, dirt, contamination, or debris from entering remainder of building:

.1 Provide construction filters on existing roof top units, replace as required and remove when Work is complete.
.2 Provide temporary partitioning and closures to contain dust and debris within immediate Work area.
.3 Suppress dust and dirt: Prevent occurrence of unsanitary conditions, flooding or leaking:

.1 Do not allow dirt, debris or discarded materials to accumulate on site; remove promptly each day.
.2 Keep clean, at all times, those areas adjacent to Work area to prevent dust from entering Owner's premises.
.3 Maintain and keep free of debris, materials and equipment, emergency and fire exits and routes.

.4 Provide illumination for safe demolition and working conditions, but in any case not less than 275 lx in areas where Work is being done.
.5 Obtain written confirmation from Owner that services to be abandoned, removed or cut have been properly and safely shut off, capped or sealed.
.6 Dispose of removed material legally; do not burn on site; do not allow debris to enter sewers.

2. PRODUCTS

2.1 Equipment

.1 Provide equipment required for safe and proper demolition as indicated.

3. EXECUTION

3.1 Preparation

.1 Confirm that Owner has removed equipment and furnishings to be salvaged, in accordance with agreed schedule.

.2 Provide shoring and bracing as needed to keep building structurally secure and free of deflection in all its parts, and as needed for installation of new structural members.

3.2 Protection

.1 Protect remaining finishes, equipment, and adjacent Work from damage caused by cutting, moving, removal, and patching operations. Protect surfaces that will remain a part of finished Work.

.2 Protect existing and new Work from weather during cutting, moving, removal, and construction. Provide weather protection and other facilities and protection as needed to prevent damage to new Work and to remaining old Work.

.3 When using a cutting torch to remove existing framing provide flame-proof screening around area of Work and cover floor area with minimum 6 mm plywood having joints taped; allow no sparks or welding or cutting spatter to fall or hit any material or finish that may be damaged or marred.

.4 Provide protection to existing fans, motors and equipment from construction materials, dirt, dust, debris, moisture, and weld spatter.

3.3 Patching, Extending And Matching

.1 Patch and extend existing Work using skilled mechanics that are capable of matching existing quality of workmanship. The quality of patched or extended Work shall not be less than that specified in Sections of product and execution Specifications that follow these General Requirements.

.2 In areas where any portion of an existing finished surface is damaged, lifted, stained or otherwise made or found to be imperfect, patch or replace imperfect portion of surface with matching material.

.3 Do not incorporate salvaged or used material in new construction, except where small quantities of finish material that are difficult to match or duplicate are approved for patching or extending purposes by Consultant.

.4 Provide adequate support or substrate for patching of finishes.

.5 If imperfect surface was painted or coated, repaint or recoat complete room. Confirm with Consultant.

.6 If surrounding surface cannot be matched, repaint or recoat entire surface.

.7 Patch and repair existing wall junctions where one wall is removed and others remain.

.8 Where new gypsum board on metal stud construction is to align with existing construction (either plaster on concrete block or gypsum lath or existing gypsum board partitions) align construction to so there is no discontinuity between surfaces.

.9 Skim Coating: Apply skim coating to new and existing gypsum board to areas scheduled for eggshell, semi-gloss or high gloss paints and to corridor walls and any other walls over five (5) metres in length and as follows:

.1 After normal gypsum board finishing but prior to priming or sealing, joints and fastener heads should be lightly sanded using a 220 mesh open weave silicon carbide sanding cloth, or wiped lightly with a damp sponge, to leave a smooth even surface covering joints and fastener heads. Caution must be taken not to raise nap of paper, if sanding.

.2 Mix joint compound slightly thinner than for joint taping, and apply a thin coating to entire surface with a trowel or gypsum board broad knife. Immediately wipe back to remove compound that is in excess of amount needed to fill texture differences and minor imperfections, and to eliminate laps or tool marks.

.3 When skim coat is completely dry, any minor ridges shall be removed by light sanding or by wiping lightly with a damp sponge.

.10 Where new finishes are called for and existing finishes are other than paint, remove existing finishes. If in doubt, verify with Consultant prior to removal. This shall include removal of existing corner guards. Repair and make good substrate prior to installing new finishes.

3.4 Repair

.1 Repair Work damaged in course of alterations, except at areas accepted otherwise by Consultant for other remedial action.

.2 Where full removal of extensive amounts of almost suitable Work would be needed to replace damaged portions, then filling, straightening, spackling and similar repair techniques, followed by full painting or other finishing, may be permitted by Consultant.

.3 Examples of Work that may frequently be approved by Consultant for repair, rather than replacement: slightly bent ceiling runners, hairline cracks in gypsum board.

.4 If repaired Work is not brought up to standard for new Work, Consultant will direct that it be cut out and replaced with new Work.

END OF SECTION

1. GENERAL

1.1 Intent

.1 The intent of Delegated Design Submittals is to account for professional engineering responsibility for design, review, and acceptance of components of the Work forming a permanent part of the Work in accordance with Building Code, and that has been assigned to a design entity other than Prime Consultant including, but not limited to, the following:

.1 Design requiring structural analysis of load bearing components and connections.
.2 Design requiring compliance with fire safety regulations.
.3 Design requiring compliance with life or health safety regulations.

.2 This section provides standard forms for submittal of Model Schedule S-B and Model Schedule S-C required complying with requirements of Building Code and design delegated to a professional engineer within Technical Specifications Sections.

.3 Delegated Design Submittals are not required for components of Work requiring engineering for temporary Work (for example: crane hoisting, engineered lifts, false Work, shoring, concrete formwork) that would normally form a part of Contractor or responsible Subcontractor's scope of Work.

.4 The requirements of this section are in general conformance with recommended Responsibilities for Engineering Services for Building Projects published by Engineers and Geoscientist British Columbia (EGBC), with regards to duties of specialty professionals appointed during construction period.

.5 The requirements of this section do not in any way diminish the Consultant's role and responsibilities as the Registered Professional of Record; submittals will be used by the Consultant to help determine and establish that Work is substantially performed in accordance with the Building Code.

1.2 Definitions

.1 Supporting Registered Professional or Supporting Certified/Qualified Practitioner: The registered professional (architect or interior designer) or certified/qualified specialist contracted by the Contractor, fabricator or manufacturer to complete design of elements identified in the Specifications and Drawings, and produce delegated design submittals using performance requirements and design criteria contained within the Specifications as follows:

.1 The Consultant is not the supporting registered professional or supporting certified/qualified practitioner.
.2 All supporting registered professionals must be licensed to practice in the province of the Work, have direct experience associated with the work delegated and are required to seal and sign submittals associated with delegated design.
.3 All supporting registered professionals and supporting certified/qualified practitioners must show proof of qualifications or certifications associated with their speciality to support design solutions required by the Specifications or when requested by the Consultant.
.4 The Consultant will provide additional performance requirements or design criteria when requested by the supporting registered professional or supporting certified/qualified practitioner.
.5 Delegated Design Professional Engineer: The professional engineer hired or contracted to the fabricator or manufacturer to design specialty elements, produce delegated design submittals and shop drawings to meet the requirements of the Project; who is registered in the province of the Work; and who is not the Consultant.

.2 Delegated Design Forms – Model Schedule S-B and Model Schedule S-C: Documents prepared by the supporting registered professional or supporting certified/qualified practitioner as recommended by and endorsed by EGBC's accepted forms for assurance and due diligence by supporting registered professional.

.3 Engineering Judgement for Fire Rated Assembly Components: A written proposal submitted by manufacturer to the Authority Having Jurisdiction arising from a variation that modifies the manufacturer's standard listed assemblies and details to account for actual site conditions, refer to Section 07 05 53 – Fire and Smoke Assembly Identification.

.4 Shop Drawings and Other Documentation: submit information described in Specifications.

1.3 Reference Standards

.1 Engineers and Geoscientists of British Columbia (EGBC):

.1 EGBC Practice Note 16: Professional Design and Field Review by Supporting Registered Professionals (September 2010)
.2 EGBC Model Schedule S-B, Assurance of Professional Design and Comment for Field Review by Supporting Registered Professional
.3 EGBC Model Schedule S-C, Assurance of Professional Field Review and Compliance by Supporting Registered Professional

1.4 Submittals

.1 Informational Submittals: Provide the following submittals during the course of the Work:

.1 Model Schedule S-B Submit a signed and sealed Model Schedule S-B on company letterhead addressed to the Consultant in accordance with format shown in Appendix A attached to the end of this Section prior to starting Work requiring design and seal of a professional engineer.

1.5 Project Closeout Submissions

.1 Record Documentation: Submit the following required information before application for Substantial Performance of the Work:

.1 Model Schedule S-C: Submit a signed and sealed Model Schedule S-C on company letterhead addressed to the Consultant on completion of Work requiring design and seal of a professional engineer.
.2 Engineering Judgements: Submit Product literature and compliance certificates as required by Section 07 84 00 – Firestopping and include any required Engineering Judgements that became necessary to account for installation conditions that are different than tested assemblies.

2. PRODUCTS

2.1 Delegated Design Submittals

.1 Performance Requirements and Design Criteria: Provide products and systems that comply with specific performance and design criteria indicated where professional design services or certifications by a design professional are specifically required of the Contractor by the Contract Documents.

.2 Submit a formal written request for additional information to the Consultant and Contractor if criteria indicated within contract documents are not sufficient to perform services or certification required.

.3 Delegated design will be required for elements designed by a specialty professional, which may include but are not necessarily limited to the following:

.1 Elements normally fabricated off-site

.2 Elements that require specialized fabrication equipment or a proprietary fabrication process not usually available at job site (for example: open web steel joists, wood trusses, combination wood and metal or plywood joists, prefabricated wood or metal buildings, noise and vibration isolation devices, elevators).

.3 Elements requiring civil engineering, not normally a part of scope of services performed by architectural; structural; mechanical; electrical; or geotechnical disciplines of the Consultant (for example: structural steel connection design, steel deck design).

3. EXECUTION

3.1 Implementation

.1 Include a Summary of Work described in technical specification section as a part of the required Model Schedule S-B.

.2 Prepare required submittals and present to the Consultant within sufficient time to allow for Consultant's detailed review and acceptance.

END OF SECTION

1. GENERAL

1.1 Summary

.1 Provide Cutting and Patching, in accordance with requirements of the Contract Documents.

1.2 Definitions

.1 Cutting: Removal of existing construction necessary to permit installation or performance of other Work.

.2 Patching: Fitting and repair work required to restore surfaces to original conditions after installation of other Work.

1.3 Submittals

.1 Informational Submittals: Submit for Consultant's Action.

.1 Cutting and Patching Proposal: Submit a proposal describing procedures at least 10 days before the time cutting and patching will be performed, requesting approval to proceed. Include the following information:

.1 Extent: Describe cutting and patching, show how they will be performed, and indicate why they cannot be avoided.
.2 Changes to Existing Construction:
.3 Describe anticipated results
.4 Include changes to structural elements and operating components as well as changes in building's appearance and other significant visual elements
.5 Products: List products to be used and firms or entities that will perform the Work.
.6 Dates: Indicate when cutting and patching will be performed.
.7 Utilities:

- List utilities that cutting and patching procedures will disturb or affect
- List utilities that will be relocated and those that will be temporarily out of service

.8 Indicate how long service will be disrupted
.9 Structural Elements: Submit details and engineering calculations showing integration of reinforcement with original structure to the Consultant prior to making cuts or modifications where cutting and patching involve adding reinforcement to structural elements.
.10 Consultant's Acceptance:

- Obtain acceptance of cutting and patching proposal before cutting and patching
- Review and acceptance of cutting and patching proposal does not waive right to later require removal and replacement of unsatisfactory work

1.4 Quality Assurance

.1 Structural Elements: Do not cut and patch structural elements in a manner that could change their load carrying capacity or load deflection ratio.

.2 Operational Elements: Do not cut and patch operating elements and related components in a manner that results in reducing their capacity to perform as intended or that results in increased maintenance or decreased operational life or safety, including but not limited to the following:

.1 Primary operational systems and equipment
.2 Air or smoke barriers
.3 Fire protection systems
.4 Control systems
.5 Communication systems
.6 Conveying systems

.7 Electrical wiring systems

.3 Miscellaneous Elements: Do not cut and patch the following elements or related components in a manner that could change their load carrying capacity, that results in reducing their capacity to perform as intended, or that result in increased maintenance or decreased operational life or safety, including but not limited to the following:

.1 Water, moisture, or vapour barriers
.2 Membranes and flashings
.3 Equipment supports
.4 Piping, ductwork, vessels, and equipment
.5 Noise and vibration control elements and systems.

.4 Visual Requirements: Do not cut and patch construction in a manner that results in visual evidence of cutting and patching. Do not cut and patch construction exposed on the exterior or in occupied spaces in a manner that would, in Consultant's opinion, reduce the building's aesthetic qualities. Remove and replace construction that has been cut and patched in a visually unsatisfactory manner. If possible, retain original Installer or fabricator to cut and patch exposed Work listed below. If it is impossible to engage original Installer or fabricator, engage another recognized, experienced, and specialized firm, including but not limited to the following:

.1 Processed concrete finishes
.2 Ornamental metal
.3 Matched woodwork
.4 Roofing
.5 Firestopping and smoke seals
.6 Window wall system
.7 Stucco
.8 Finished flooring
.9 Finished coatings
.10 Wall coverings
.11 HVAC enclosures, cabinets, or covers

.5 Cutting and Patching Conference: Before proceeding, meet at Project site with parties involved in cutting and patching, including mechanical and electrical trades. Review areas of potential interference and conflict. Coordinate procedures and resolve potential conflicts before proceeding.

1.5 Warranty

.1 Existing Warranties: Remove, replace, patch, and repair materials and surfaces cut or damaged during cutting and patching operations, by methods and with materials so as not to void existing warranties.

2. PRODUCTS

2.1 Materials

.1 Comply with requirements specified in other Sections of the Project Manual.

.2 Existing Materials: Use materials identical to existing materials. For exposed surfaces, use materials that visually match existing adjacent surfaces to the fullest extent possible:

.1 If identical materials are unavailable or cannot be used, use materials that, when installed, will match the visual and functional performance of existing materials.

3. EXECUTION

3.1 Examination

.1 Examine surfaces to be cut and patched and conditions under which cutting and patching are to be performed:

.1 Provide investigative methods that use non-ionizing radiation or other approved method to determine locations of existing services and reinforcing in existing concrete slabs and block walls before cutting and renovations.
.2 Advise Consultant of findings before proceeding with the Work and revise penetration locations as required and directed by Consultant.
.3 Verify compatibility with and suitability of substrates, including compatibility with existing finishes or primers before patching.
.4 Proceed with installation only after unsafe or unsatisfactory conditions have been corrected.

3.2 Preparation

.1 Protection: Protect existing construction during cutting and patching to prevent damage. Provide protection from adverse weather conditions for portions of Project that might be exposed during cutting and patching operations.

.2 Adjoining Areas: Avoid interference with use of adjoining areas or interruption of free passage to adjoining areas.

.3 Existing Services: Where existing services are required to be removed, relocated, or abandoned, bypass such services before cutting to minimize interruption of services to occupied areas.

3.3 Performance

.1 Employ skilled workers to perform cutting and patching. Proceed with cutting and patching at the earliest feasible time, and complete without delay:

.1 Cut existing construction to provide for installation of other components or performance of other construction, and subsequently patch as required to restore surfaces to their original condition.

.2 Cut existing construction by sawing, drilling, breaking, chipping, grinding, and similar operations, including excavation, using methods least likely to damage elements retained or adjoining construction. If possible, review proposed procedures with original Installer; comply with original Installer's written recommendations:

.1 In general, use hand or small power tools designed for sawing and grinding, not hammering and chopping. Cut holes and slots as small as possible, neatly to size required, and with minimum disturbance of adjacent surfaces. Temporarily cover openings when not in use.
.2 Existing Finished Surfaces: Cut or drill from the exposed or finished side into concealed surfaces.
.3 Concrete or Masonry: Cut using a cutting machine, such as an abrasive saw or a diamond core drill.
.4 Excavating and Backfilling: Comply with requirements in applicable Division 31 Sections where required by cutting and patching operations.
.5 Mechanical and Electrical Services: Cut off pipe or conduit in walls or partitions to be removed. Cap, valve, or plug and seal remaining portion of pipe or conduit to prevent entrance of moisture or other foreign matter after cutting.
.6 Proceed with patching after construction operations requiring cutting are complete.

.3 Patch construction by filling, repairing, refinishing, closing up, and similar operations following performance of other Work. Patch with durable seams that are as invisible as possible. Provide materials and comply with installation requirements specified in other Sections of these Specifications:

.1 Inspection: Where feasible, test and inspect patched areas after completion to demonstrate integrity of installation.
.2 Exposed Finishes: Restore exposed finishes and extend on to adjoining construction using techniques that completely hide patching and refinishing work.
.3 Floors and Walls:

.1 Patch and repair floor and wall surfaces in the new space where walls or partitions that are removed extend from one finished area into another.
.2 Provide an even surface of uniform finish, colour, texture, and appearance.
.3 Remove existing floor and wall coverings and replace with new materials, if necessary, to achieve uniform colour and appearance.
.4 Apply primer and intermediate paint coats over patch and apply final paint coat over entire unbroken surface containing the patch where patching occurs in a painted surface; provide additional coats until patch blends with adjacent surfaces.

.4 Ceilings: Patch, repair, or re-hang existing ceilings as necessary to provide an even plane surface of uniform appearance.
.5 Exterior Building Enclosure: Patch components in a manner that restores enclosure to a weather tight condition.

3.4 Cutting And Patching

.1 Do not cut, bore or sleeve any structural elements without the written acceptance of Consultant.

.2 Submit written request in advance of cutting or alteration which affects the following:

.1 Structural integrity of any element of the Project
.2 Integrity of weather-exposed or moisture-resistant elements
.3 Efficiency, maintenance, or safety of any operational elements
.4 Visual qualities of sight-exposed elements
.5 Work of Owner or separate Subcontractor as applicable

.3 Include in request:

.1 Identification of Project
.2 Location and description of affected work
.3 Statement on necessity for cutting or alteration
.4 Description of proposed work, and products to be used
.5 Alternatives to cutting and patching
.6 Effect on work of owner or separate Subcontractor
.7 Date and time work will be executed

.4 After uncovering, inspect conditions affecting performance of Work.

.5 Beginning of cutting or patching means acceptance of existing conditions.

.6 Perform cutting, fitting, and patching, including excavation and backfilling, to complete the Work.

.7 Cut and drill with true, smooth edges and to minimum suitable tolerances. Do not oversize holes.

.8 Fit the several parts together, to integrate with other work.

.9 Uncover work to install ill-timed work.

.10 Remove and replace defective and non-conforming work.

.11 Remove samples of installed work for testing as required by the Consultant.

.12 Provide openings in non-structural elements of Work for penetrations of Mechanical and Electrical work.

.13 Perform work to avoid damage to other work.

.14 Provide supports to assure structural integrity of surroundings devices and methods to protect other portions of project from damage.

.15 Provide protection from elements for areas which may be exposed by uncovering work.

.16 Prepare surfaces to receive patching and finishing.

.17 Employ qualified installer to perform cutting and patching for weather exposed and moisture resistant elements, and site exposed surfaces.

.18 Cut rigid materials using power saw or core drill, except when otherwise noted. Pneumatic or impact tools are not allowed without approval from the Consultant.

.19 Restore work with new products in accordance with the Contract Documents.

.20 Fit work airtight to exterior envelope and fire rated to interior to pipes, sleeves, ducts, conduit, and other penetrations through surfaces.

.21 At penetration of fire rated wall, ceiling, or floor construction, completely seal voids with fire-rated material, specified in Section 07 84 00, full thickness of the construction element, to the satisfaction of the Authority Have Jurisdiction.

.22 Ensure that waterproofing, roofing, or sealants are suitably protected from damage. Where waterproofing or roofing or seals must be cut or damaged to facilitate installation of work ensure that waterproofing, roofing and seals are immediately repaired and made watertight, using the original installer or approved alternate installer and materials and installation methods to match original work.

.23 Refinish surfaces to match adjacent finishes; for continuous surfaces refinish to nearest intersection. For an assembly, refinish entire unit.

.24 Making good is in general defined as matching the adjacent surfaces such that there be no visible difference between patched surfaces and adjacent surfaces when viewed in ambient light.

.25 At all penetrations through acoustically treated wall and partition assemblies, completely seal all penetrations with acoustic sealant, tape and insulation as required to prevent sound transfer and to maintain the required STC rating of wall.

END OF SECTION

1. GENERAL

1.1 Waste Management Goals

.1 Prior to start of Work conduct meeting with Consultant to review and discuss Waste Management Plan and Goals.

.2 Accomplish maximum control of solid construction waste.

.3 Preserve environment and prevent pollution and environment damage.

1.2 Definitions

.1 Class III: non-hazardous waste - construction renovation and demolition waste.

.2 Inert Fill: inert waste - exclusively asphalt and concrete.

.3 Recyclable: ability of product or material to be recovered at end of its life cycle and re-manufactured into new product for reuse.

.4 Recycle: process by which waste and recyclable materials are transformed or collected for purpose of being transferred into new products.

.5 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.

.6 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.

.7 Salvage: removal of structural and non-structural materials from deconstruction/disassembly projects for purpose of reuse or recycling.

.8 Separate Condition: refers to waste sorted into individual types.

.9 Source Separation: acts of keeping different types of waste materials separate beginning from first time they became waste.

1.3 Storage, Handling and Protection

.1 Store, materials to be reused, recycled and salvaged in locations as directed by Consultant.

.2 Unless specified otherwise, materials for removal become Contractor's property.

.3 Protect, stockpile, store and catalogue salvaged items.

.4 Separate non-salvageable materials from salvaged items. Transport and deliver non-salvageable items to licensed disposal facility.

.5 Protect structural components not removed for demolition from movement or damage.

.6 Support affected structures. If safety of building is endangered, cease operations and immediately notify Consultant.

.7 Protect surface drainage, mechanical and electrical from damage and blockage.

.8 Separate and store materials produced during dismantling of structures in designated areas.

.9 Prevent contamination of materials to be salvaged and recycled and handle materials in accordance with requirements for acceptance by designated facilities.

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

1.4 Disposal of Wastes

.1 Do not bury rubbish or waste materials.

.2 Do not dispose of waste, volatile materials, mineral spirits, oil, and paint thinner into waterways, storm, or sanitary sewers.

.3 Remove materials from deconstruction as deconstruction/disassembly Work progresses.

.4 Prepare project summary to verify destination and quantities on a material-by-material basis as identified in pre-demolition material audit.

1.5 Use Of Site and Facilities

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

.2 Maintain security measures established by existing facility.

1.6 Scheduling

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

2. PRODUCTS

2.1 Not Used

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

1. GENERAL

1.1 Summary

.1 Provide selective exterior building demolition in accordance with requirements of the Contract Documents.

.2 This Section includes the following:

.1 Demolition and removal of selected portions of exterior building components or structural elements
.2 Demolition of mechanical and electrical equipment.
.3 Demolition and removal of selected site elements.
.4 Repair procedures for selective demolition operations.

.3 This section does not include the following:

.1 Removal of hazardous materials or asbestos abatement
.2 Demolition of interior building components and finishes

.4 Drawings contain details that suggest directions for solving some of the major demolition and removal requirements for this project; General Contractor is required to develop these details further by submitting a demolition plan prepared by a professional engineer employed by the General Contractor.

1.2 Definitions

.1 Demolish: Detach items from existing construction and legally dispose of them off site, unless indicated to be removed and salvaged or removed and reinstalled.

.2 Remove and Salvage: Detach items from existing construction and deliver them to Owner ready for reuse.

.3 Remove and Reinstall: Detach items from existing construction, prepare them for reuse, and reinstall them where indicated.

.4 Existing to Remain: Existing items of construction that are not removed and that are not otherwise indicated as being removed, removed and salvaged, or removed and reinstalled.

1.3 References

.1 Canadian Federal Legislation:

.2 Canadian Environmental Protection Act (CEPA),

.3 Canadian Environmental Assessment Act (CEAA),

.4 Transportation of Dangerous Goods Act (TDGA),

.5 Motor Vehicle Safety Act (MVSA),

.6 Hazardous Materials Information Review Act,

1.4 Administrative Requirements

.1 Materials Ownership:

.1 Except for items or materials indicated to be reused, salvaged, reinstalled, or otherwise indicated to remain Owner's property, demolished materials shall become General Contractor’s property and shall be removed from Project site.

.2 Historic items, relics, and similar objects including, but not limited to, cornerstones and their contents, commemorative plaques and tablets, antiques, and other items of interest or value to Owner that may be encountered during demolition remain Owner's property:

.1 Carefully remove and salvage each item or object in a manner to prevent damage and deliver promptly to Owner.
.2 Coordinate with Owner's adviser, who will establish special procedures for removal and salvage.

.2 Pre-Demolition Meeting: Conduct a pre-demolition meeting at Project site, as follows:

.1 Inspect and discuss condition of construction being demolished.
.2 Review structural load limitations of existing structures.
.3 Review and finalize building demolition schedule and verify availability of demolition personnel, equipment, and facilities needed to make progress and avoid delays.
.4 Review and finalize protection requirements.

.3 Coordination: Arrange demolition schedule so as not to interfere with Owner's on-site operations at adjacent site.

1.5 Submittals

.1 Action Submittals: Provide the following submittals before starting any work of this Section:

.1 Schedule of Demolition Activities: indicate the following:

.1 Detailed sequence of demolition and removal work, with starting and ending dates for each activity
.2 Interruption of utility services
.3 Coordination for shutoff, capping, and continuation of utility services
.4 Locations of temporary partitions and means of egress

.2 Demolition Plan: Submit a plan of demolition area indicating extent of temporary facilities and supports, methods of removal and demolition prepared by a professional engineer in accordance with requirements of Authority Having Jurisdiction, and as follows:

.1 Proposed Dust-Control and Noise-Control Measures: Submit statement or drawing that indicates the measures proposed for use, proposed locations, and proposed time frame for their operation.
.2 Inventory: Submit a list of items that have been removed and salvaged after demolition is complete.
.3 Landfill Records: Indicate receipt and acceptance of hazardous wastes by a landfill facility licensed to accept hazardous wastes.

.2 Informational Submittals: Provide the following submittals when requested by the Consultant:

.1 Certificates: Submit Statement of Refrigerant Recovery as follows:

.1 Signed by refrigerant recovery technician responsible for recovering refrigerant, stating that all refrigerant that was present was recovered and that recovery was performed according to regulations of Authority Having Jurisdiction.
.2 Include name and address of technician and date refrigerant was recovered.

.2 Qualification Data: Submit information for companies and personnel indicating their capabilities and experience to perform work of this Section including; but not limited to, lists of completed projects with project names and addresses, names and addresses of architects and owners, for work of similar complexity and extent.

1.6 Quality Assurance

.1 Regulatory Requirements: Comply with governing environmental notification requirements and regulations before beginning selective demolition. Comply with hauling and disposal regulations of authorities having jurisdiction.

.2 Demolition Firm Qualifications: An experienced firm that has specialized in demolition work similar in material and extent to that indicated for this Project:

.1 Conform to the Occupational Health and Safety Act and Regulations.
.2 Conform to Workers' Compensation Board Regulations.
.3 Conform to the City of White Rock bylaws and regulations governing this type of work.

.3 Standards: Comply with regulations of local authorities having jurisdiction and standards referenced in 1.2.4 above. Where differences occur between the local regulations and referenced standards, the most restrictive requirement shall govern.

.4 Pre-demolition Meeting: Conduct a pre-demolition meeting at Project site.

1.7 Site Conditions

.1 Owner will occupy portions of building immediately adjacent to selective demolition area:

.1 Conduct selective demolition so that Owner's operations will not be disrupted.
.2 Provide not less than 72 hours notice to Owner of activities that will affect Owner's operations.

.2 Maintain access to existing walkways, corridors, and other adjacent occupied or used facilities:

.1 Do not close or obstruct walkways, corridors, or other occupied or used facilities without written permission from authorities having jurisdiction.

.3 Owner assumes no responsibility for condition of areas to be selectively demolished:

.1 Conditions existing at time of Pre-Bid Site Review will be maintained by Owner as far as practical.
.2 Owner will remove the following items prior to selective demolition:

.4 Hazardous Materials: Hazardous materials are not expected to be encountered.

.1 If items are suspected of containing hazardous materials, do not disturb hazardous materials, stop work and contact Owner immediately.

.5 Storage or sale of removed items or materials on site will not be permitted.

.6 Maintain existing utilities indicated to remain in service and protect them against damage during selective demolition operations.

.7 Maintain fire-protection facilities in service during selective demolition operations.

2. PRODUCTS

2.1 Temporary Support Structures

.1 Design temporary support structures required for demolition work and underpinning and other foundation supports necessary for the project using a qualified professional engineer registered or licensed in province of the Work.

2.2 Repair Materials

.1 Use repair materials identical to existing materials:

.1 If identical materials are unavailable or cannot be used for exposed surfaces, use materials that visually match existing adjacent surfaces to the fullest extent possible.
.2 Use materials whose installed performance equal or surpasses that of existing materials.

.2 Comply with material and installation requirements specified in individual technical specification Sections.

2.3 Retained Materials

.1 Items to be retained for re-use in new construction as indicated on Drawings.

3. EXECUTION

3.1 Examination

.1 Verify that utilities have been disconnected and capped.

.2 Survey existing conditions and correlate with requirements indicated to determine extent of selective demolition required.

.3 Inventory and record the condition of items to be removed and reinstalled and items to be removed and salvaged.

.4 Notify the Consultant where existing mechanical, electrical, or structural elements conflict with intended function or design:

.1 Investigate and measure the nature and extent of conflict and submit a written report to Consultant.
.2 Consultant will issue additional instructions or revise drawings as required to correct conflict.

.5 Engage a Professional Engineer to survey condition of building when removing elements that may result in structural deficiency or unplanned collapse of any portion of structure or adjacent structures during selective demolition operations.

.6 Perform surveys as the Work progresses to detect hazards resulting from selective demolition activities.

3.2 Utility Services

.1 Coordinate existing services indicated to remain and protect them against damage during selective demolition.

.2 Locate, identify, disconnect, and seal or cap off indicated utilities serving areas to be selectively demolished.

.1 Arrange to shut off affected utilities with utility companies.
.2 If utility services are required to be removed, relocated, or abandoned, before proceeding with selective demolition provide temporary utilities that bypass area of selective demolition and that maintain continuity of service to other parts of building.
.3 Cut off pipe or conduit in walls or partitions to be removed. Cap, valve, or plug and seal remaining portion of pipe or conduit after bypassing.
.4 Cut off pipe or conduit to a minimum of 25 mm below slab to remain, and remove concrete mound. Patch concrete.

.3 Coordinate with Mechanical and Electrical Divisions for shutting off, disconnecting, removing, and sealing or capping utilities.

.4 Do not start selective demolition work until utility disconnecting and sealing have been completed and verified in writing.

.5 Existing Utilities:

.1 Demolish existing utilities and below-grade utility structures that are within 1530 mm outside of footprint indicated for new construction; abandon utilities outside this area, fill abandoned utility structures with satisfactory soil materials.

3.3 Preparation

.1 Drain, purge, or otherwise remove, collect, and dispose of chemicals, gases, explosives, acids, flammables, or other dangerous materials before proceeding with selective demolition operations.

.2 Conduct selective demolition and debris removal operations to ensure minimum interference with roads, streets, walks, walkways, and other adjacent occupied and used facilities:

.1 Do not close or obstruct streets, walks, walkways, or other adjacent occupied or used facilities without permission from Owner and authorities having jurisdiction. Provide alternate routes around closed or obstructed traffic ways if required by governing regulations.
.2 Erect temporary protection, such as walks, fences, railings, canopies, and covered passageways, where required by authorities having jurisdiction.
.3 Protect existing site improvements, appurtenances, and landscaping to remain.
.4 Erect a plainly visible fence around drip line of individual trees or around perimeter drip line of groups of trees to remain.

.3 Provide temporary barricades and other protection required to prevent injury to people and damage to adjacent buildings and facilities to remain, and as follows:

.1 Provide protection to ensure safe passage of people around selective demolition area and to and from occupied portions of building.
.2 Provide temporary weather protection, during interval between selective demolition of existing construction on exterior surfaces and new construction, to prevent water leakage and damage to structure and interior areas.
.3 Protect walls, ceilings, floors, and other existing finish work that are to remain or that are exposed during selective demolition operations.
.4 Cover and protect furniture, furnishings, and equipment that have not been removed.

.4 Provide temporary enclosures for protection of existing building and construction, in progress and completed, from exposure, foul weather, other construction operations.

.1 Provide temporary weather tight enclosure for building exterior.
.2 Where heating or cooling is needed and permanent enclosure is not complete, provide insulated temporary enclosures.
.3 Coordinate enclosure with ventilating and material drying or curing requirements to avoid dangerous conditions and effects.

.5 Erect and maintain dustproof partitions and temporary enclosures to limit dust and dirt migration and to separate areas from fumes and noise.

.6 Provide and maintain shoring, bracing, or structural support to preserve stability and prevent movement, settlement, or collapse of construction to remain, and to prevent unexpected or uncontrolled movement or collapse of construction being demolished:

.1 Strengthen or add new supports when required during progress of selective demolition.

3.4 Concrete Slab Reinforcing

.1 Locate location of reinforcing steel in concrete slabs prior to cutting or coring using non-destructive, non-ionizing radio frequency locators.

.2 Core concrete slabs to avoid reinforcing steel, electrical conduit or water pipes; adjust core location and coordinate with Engineer where slab features interfere with core drilling.

.3 Notify the Engineer immediately for further instructions where coring or cutting will damage existing slab features.

3.5 Concrete Demolition

.1 Below-Grade Construction: Demolish foundation walls and other below grade construction including; but not limited to, the following:

.1 Basements
.2 Foundation walls
.3 Footings
.4 Piles completely.

3.6 Pollution Controls

.1 Dust Control: Provide temporary enclosures or other suitable methods reviewed and accepted by the Consultant, to limit spread of dust and dirt. Comply with governing environmental protection regulations, and as limited below:

.1 Do not use water when it may damage existing construction or create hazardous or objectionable conditions, such as ice, flooding, and pollution.
.2 Wet mop floors to eliminate tracking of dirt, wipe down walls and doors of demolition enclosure. Vacuum carpeted areas.

.2 Remove and transport debris to prevent spillage on adjacent surfaces and areas.

.3 Remove debris from elevated portions of building by chute, hoist, or other device that will convey debris to grade level in a controlled descent.

.4 Clean adjacent structures and improvements of dust, dirt, and debris caused by selective demolition operations. Return adjacent areas to condition existing before selective demolition operations began.

3.7 Selective Demolition

.1 Demolish and remove existing construction only to the extent required by new construction and as indicated. Use methods required to complete the Work within limitations of governing regulations and as follows:

.1 Proceed with selective demolition systematically, from higher to lower level. Complete selective demolition operations above each floor or tier before disturbing supporting members on the next lower level.
.2 Neatly cut openings and holes plumb, square, and true to dimensions required. Use cutting methods least likely to damage construction to remain or adjoining construction. Use hand tools or small power tools designed for sawing or grinding, not hammering and chopping, to minimize disturbance of adjacent surfaces. Temporarily cover openings to remain.
.3 Cut or drill from the exposed or finished side into concealed surfaces to avoid marring existing finished surfaces.
.4 Do not use cutting torches until work area is cleared of flammable materials. At concealed spaces, such as duct and pipe interiors, verify condition and contents of hidden space before starting flame-cutting operations. Maintain fire watch and portable fire-suppression devices during flame-cutting operations.
.5 Maintain adequate ventilation when using cutting torches.
.6 Remove decayed, vermin-infested, or otherwise dangerous or unsuitable materials and promptly dispose of off-site.
.7 Remove structural framing members and lower to ground by method suitable to avoid free fall and to prevent ground impact or dust generation.
.8 Locate selective demolition equipment and remove debris and materials so as not to impose excessive loads on supporting walls, floors, or framing.
.9 Dispose of demolished items and materials promptly.
.10 Return elements of construction and surfaces that are to remain to condition existing before selective demolition operations began.

.2 Comply with Owner's requirements for using and protecting, stairs, walkways, loading docks, building entries, and other building facilities during selective demolition operations.

.3 Removed and Salvaged Items:

.1 Clean salvaged items
.2 Pack or crate items after cleaning
.3 Identify contents of containers
.4 Store items in a secure area until delivery to Owner
.5 Transport items to Owner's storage area [on-site] [off-site] [designated by Owner] [indicated on Drawings]
.6 Protect items from damage during transport and storage

.4 Removed and Reinstalled Items:

.1 Clean and repair items to functional condition adequate for intended re-use. Paint equipment to match new equipment
.2 Pack or crate items after cleaning and repairing
.3 Identify contents of containers
.4 Protect items from damage during transport and storage
.5 Reinstall items in locations indicated
.6 Comply with installation requirements for new materials and equipment
.7 Provide connections, supports, and miscellaneous materials necessary to make item functional for use indicated

.5 Existing Items to Remain:

.1 Protect construction indicated to remain against damage and soiling during selective demolition
.2 Items may be removed to a suitable, protected storage location during selective demolition and cleaned and reinstalled in their original locations after selective demolition operations are complete

.6 Concrete: Demolish as indicated on Drawings.

.7 Concrete Slabs-on-Grade: Saw-cut perimeter of area to be demolished, then break up and remove as indicated on Drawings.

3.8 Patching and Repairs

.1 Promptly repair damage to adjacent construction caused by selective demolition operations.

.2 Where repairs to existing surfaces are required, patch to produce surfaces suitable for new materials.

.3 Completely fill holes and depressions in remaining existing masonry walls remain with an approved masonry patching material applied according to manufacturer's written recommendations.

.4 Restore exposed finishes of patched areas and extend restoration into adjoining construction in a manner that eliminates evidence of patching and refinishing in accordance with Contract Documents.

3.9 Disposal of Demolished Materials

.1 Promptly dispose of demolished materials.

.2 Do not allow demolished materials to accumulate onsite.

.3 Do not burn demolished materials.

.4 Transport demolished materials off Owner's property and legally dispose at a provincially sanctioned landfill site.

END OF SECTION

1. GENERAL

1.1 Intent

.1 Hazardous materials have been identified in existing building materials, as indicated in the reports attached to this package.

.2 Recommendations contained in this report are to be followed as may be applicable to work of this Section. Removal, disturbance of hazardous materials is to be carried out by contractor experienced and licensed in work of this type.

.3 Removal of asbestos and other hazardous building materials is within the scope of this contract.

.1 Subcontractor shall be a firm that employs qualified workers with asbestos and hazardous materials removal training and certification to perform the work.

.4 Third Party Agency hired by The City's Representative will monitor the hazardous material removal, including conducting the following:

.1 Air monitoring and inspections associated with asbestos abatement
.2 Sampling and documentation of additional suspect materials discovered during abatement or demolition
.3 Documentation of additional hazardous building materials identified and associated changes to scope.
.4 Supplemental sampling to further delineate previously identified hazardous building materials, if requested or required.
.5 Documentation of changes to scope (additions or reductions) based on results of supplemental sampling of previously identified materials, if requested or required
.6 Visual verification and documentation of hazardous building material removal, where necessary.
.7 The Subcontractor is responsible to coordinate with the Third Party Agency.

.5 SubContractor shall submit the following information to the General Contractor:

.1 Applicable "Notice of Project" documentation pertaining to asbestos abatement, to authorities having jurisdiction
.2 The name(s) of the waste facility or facilities (e.g. recycling facilities, landfills, destruction facilities, etc.) where the hazardous building material shall be disposed, included in the WORKPLAN
.3 Copies of the scale tickets, manifests, waybills and/or other and written confirmation(s) of disposal (i.e. landfill weigh scale receipts).
.4 Documentation outlining the number of loads, unit measures, date and time of each load transported to the disposal facility.
.5 General Contractor may request additional scaling of the trucks at any time during transportation.

1.2 Regulations, Standards and/or Codes

.1 Regulations, standards and/or codes including, but not limited to the following will apply to the abatement work to be conducted:

.1 The Occupational Health and Safety Act, Regulations and Code
.2 The current version of the Asbestos Abatement Manual published by the Government of BC, Employment, Immigration and Industry
.3 The BC Users Guide for Waste Managers
.4 BC Dangerous Goods Transportation and Handling Act
.5 The Federal Transportation of Dangerous Goods Regulation
.6 The Federal PCB Regulations
.7 Waste Management Act - Ozone Depleting Substances and Other Halocarbons Regulation
.8 The Federal Halocarbons Regulation
.9 Canadian Construction Association Standard Construction Document CCA 82 "mould guidelines for the Canadian construction industry"

.10 ABSA the pressure equipment safety authority

1.3 Documents

.1 Refer to information on Hazardous Building Materials Assessment, attached to this section.

1.4 Scope of Abatement Activities

.1 Abatement shall be conducted to remove and dispose of hazardous building materials as identified in the reports referenced herein, in accordance with applicable regulations, guidelines, standards and/or best practices for such work.

.2 The information pertaining to identified hazardous building materials listed below is provided for information purposes only. Verification and/or measurement of the amount of each hazardous building material listed are the responsibility of the Subcontractor, and can be conducted at the mandatory site viewing, if necessary.

1.5 Recommendations

.1 Refer to recommendations by listed in attached information.

.2 Recommendations contained in this report are to be followed as may be applicable to work of this Section. Removal, disturbance of hazardous materials is to be carried out by contractor experienced and licensed in work of this type.

END OF SECTION

ANTIQUITY
ENVIRONMENTAL CONSULTING LTD

HAZARDOUS MATERIALS INSPECTION REPORT

Resort Municipality of Whistler, B.C.
March 13th, 2017

Prepared by: Antiquity Environmental Consulting Ltd.
Reviewed by: Trevor Getty; CIH, ROH, CRSP, CPHI (c), ABI

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1.0 SUMMARY

Antiquity Environmental Consulting Ltd. (AECL) was retained by Mr. Andy Chalk (client) to conduct a hazardous material inspection (HMI) at 8020 Nesters Road, 4315 Blackcomb Way, and 4325 Blackcomb Way, Whistler, British Columbia (the Sites).

AECL inspected a total of five (5) buildings during the survey. The buildings inspected and sampled are as follows;

- Fire Hall
- Municipal Hall (1st floor)
- Main Works Yards Building
- Roads Building, and
- Utilities Building

AECL staff collected one hundred-eighty (180) bulk samples from the building for asbestos analysis; of these one hundred-eighty (180) samples, zero (0) samples were confirmed to contain asbestos.

AECL staff also collected nine (9) surface-coating samples to determine lead content by means of X-ray fluorescence analysis; of these nine (9) samples, four (4) sample were confirmed to contain levels of lead above Work Safe BC's (WSBC) 90 mg/kg (ppm) definition of lead containing material.

A summary table of positive asbestos-containing materials (Table 1) and lead containing surface coatings (Table 2) have been provided below;

TABLE 1 - SUMMARY OF ASBESTOS-CONTAINING MATERIALS

No asbestos was detected in any of the samples collected from the five buildings between February 28th and March 2nd, 2017.

Sample ID	Material Type	Sample Description	Location	Asbestos Content	Estimated Quantity	Abatement Risk Level
N/A	N/A	N/A	N/A	N/A	N/A	N/A

TABLE 2 – SUMMAY OF XRF METAL CONCENTRATION ANALYSIS RESULTS

Sample IDs	Area	Location	Material Type	Colour	Lead Conc. (ppm)
FH-Pb2	Exterior Wood Siding	Wall	Paint Chip	Red	**167 (±19)**
MW-Pb2	Exterior Stairwell	Railing	Paint Chip	Brown	**490 (±25)**

MH-Pb2	Exterior Wood Siding	Wall	Paint Chip	Beige	**3624 (±59)**
UB-Pb2	Exterior Steel Beam	Truck Bay	Paint Chip	Grey	**468 (±24)**
➢ **ND** = Not Detected					
➢ Sample results included in Appendix B of this document					

2.0 INTRODUCTION

The purpose of the HMI is to assemble a quantitative inventory of potentially hazardous substances at the site to facilitate future demolition or renovation. The HMI Survey included the following hazardous materials:

- Asbestos Containing Building Materials (ACMS);
- Lead Based Paints (LBPS);
- Ozone Depleting Substances (ODS);
- Polychlorinated Biphenyls (PCBS);
- Mercury Containing Equipment (MCE);
- Radon;
- Radioactive Sensors;
- Urea Formaldehyde Foam Insulation;
- Mould or Microbial Contamination; and
- Other Chemicals.

An HMI identifies the hazardous materials present, their locations, and general quantities. The information provided in this assessment will allow contractors involved in demolition or renovation activities to take appropriate steps to control the potential exposure of hazardous materials to workers and the general public.

During the HMI, Antiquity staff collected samples of potential asbestos and lead-containing materials, which were submitted for laboratory analysis. Antiquity also made visual observations of any potential ozone depleting substances (ODS), polychlorinated biphenyls (PCBs), mercury containing equipment, radon, radioactive sensors, urea formaldehyde foam insulation (UFFI), mould growth, or other chemicals for the purpose of identifying substances which may be considered hazardous.

2.1 REGULATORY REQUIREMENTS

In the province of B.C., asbestos in buildings and/or workplaces is regulated under *Occupational Health and Safety Regulation* (BC Reg.) 296/97, as amended. This regulation outlines general requirements for asbestos including mandatory identification, classification, procedures, and monitoring of asbestos-containing materials (ACMs) in the workplace. B.C. Reg. 296/97, as amended, defines ACM (other than vermiculite) as containing 0.5% or more asbestos by weight as determined by laboratory analysis. The Workers' Compensation Board of B.C. *(WorkSafeBC)* has also

published a guidance document entitled *Safe Work Practices for Handling Asbestos (2012 edition)*, which outlines acceptable standards and procedures for the management of asbestos in B.C.

Furthermore, waste asbestos must be transported according to the Federal *Transportation of Dangerous Goods Act (TDG)* and *Regulations*, and transported and managed according to B.C.'s *Environmental Management Act*, the *Hazardous Waste Regulation* (HWR), and any applicable local government landfill rules.

In the province of B.C., lead containing coatings are regulated under *Occupational Health and Safety Regulation* (BC Reg.) Section 6.59 - 6.69. The Workers' Compensation Board of B.C. *(WorkSafeBC)* has also published a guidance document entitled *Lead Containing Paints and Coatings "Preventing Exposure in the Construction Industry (2012 edition)*, which outlines acceptable standards and procedures for the management of lead in B.C. Furthermore, waste lead containing coatings must be transported according to the Federal *Transportation of Dangerous Goods Act (TDG) and Regulations*, and transported and managed according to B.C.'s *Environmental Management Act (EMA)*, the *Hazardous Waste Regulation (HWR)*, and any applicable local government landfill rules.

In the province of B.C., Ozone Depleting Substances (ODS), Polychlorinated Biphenyls (PCBs) and Mercury containing equipment (MCE) in structures are regulated under Part 5 of the *Occupational Health and Safety Regulations* (BC Reg.). Regulations outline handling and exposure limits for each of the substances as well as responsibilities of the employer and employee.

Further, all environmental matters pertaining to waste including hazardous building materials identified are subject to the BCMOE regulations under the EMA and the Federal TDG regulations including transport and disposal to a licensed facility. Proper manifesting of materials is required prior to the materials leaving the site.

A management plan (MP) for hazardous materials can be established if hazardous materials identified are to remain in-place. For example, lead paint and asbestos containing materials present at a project site may be completely removed or remain on-site encapsulated, or enclosed and managed under a Management Plan (MP) using procedures similar to that described in the *WorkSafe B.C.* guidance documents. The MP outlines the materials, their location, condition and responsibilities of both the employer and employees.

Most MPs are written for older sites that contain hazardous materials in varying amounts and conditions. If a survey documents the presence of asbestos or lead containing material that are in a friable or poor condition, these materials are usually removed because the system is no longer in use and continued presence of these materials requires long term inspection and maintenance schedules.

2.2 PREVIOUS REPORTS

Resort Municipality of Whistler Municipal Office, conducted by Antiquity Environmental Consulting Ltd, dated March 24th, 2013.

3.0 SITE REVIEW

AECL staff attended the buildings between the dates of February 28th and March 2nd, 2017. AECL completed a visual review and testing for suspect asbestos building materials and lead surface coatings from the exterior and interior of the five buildings. It is our understanding that the building is to undergo periodic renovations to the interior of the buildings.

Roofing materials and exterior stucco (fire hall/main works building) were not sampled at the request of the client due to the destructive nature of the sampling procedure. These materials are not anticipated to be demolished or

renovated in the short term. In the event of demolition or renovation of these materials, further testing of the stucco and roofing is required.

Mr. Chris Jenkins, ABI and Brendan Getty of Antiquity Environmental Consulting Ltd. completed the initial visual review within the survey area on Thursday, February, 28rd, 2017. During the HMI site visit, any areas not used under normal building occupancy or from a standing position were observed using a 2m (6 ft.) ladder. Additional areas which were concealed behind walls, below floors, above closed ceiling systems, etc., were not accessed during the visual review. The roof of the building was not accessible during this HMI due to icy conditions and fall protection requirements (> 10ft).

3.1 DESCRIPTION OF SURVEY AREA

The fire hall located at 4315 Blackcomb Way is a wood framed building with a painted wood exterior finish and asphalt shingle roof. Consisting of three (3) floors, the building is complete with a large garage, private offices, storage areas, a lounge area with a loft on the second floor, and several private sleeping quarters on the third floor. The interior consists of walls and ceilings of drywall finish, texture coated ceiling, acoustic ceiling tile, and carpet tile floors.

The municipal hall (1st floor) located at 4325 Blackcomb Way is a wood framed building with a painted wood siding exterior and drywall interior finish. The 1st floor consisted of multi private offices and several open office spaces.

The main works yard located at 8020 Nesters Road, consists of the main works, roads, and utilities buildings, as well as other buildings not included in this survey.

- The main works building is a multi office facility with several workshops, and storage areas. The exterior is finished with metal cladding and stucco with an metal cladding roof. The main works building has undergone renovations throughout the interior and has had building extensions added over the years.
- The roads building is a smaller facility complete with a truck bay, garage/workshop, storage rooms, lunchroom, office, and two washrooms. The upper floor lunchroom has had minor renovations.
- The utilities building is also similar in construction and was erected in 1997. It has a large truck bay/storage area, garage with welding shop, tool storage, and an office area on the upper floor. There is also a two-story storage facility located at the rear of the building called “archives”, with a drywall interior finish.

3.2 ON-SITE OBSERVATIONS

The following observations were noted on site:

- The buildings surveyed were occupied at the time of the investigation,
- The main works yard buildings are steel girder/cinder block construction with wood framed interior workshops and offices,
- Textured and non-texture ceilings were observed throughout the buildings, as well as acoustic ceiling tiles,
- The exterior of the main works yard buildings (main, roads, & utilities), were finished with metal cladding,
- The fire hall and municipal hall were finished with wood painted wood siding,
- The fire hall was finished with an asphalt shingle roof,

- The main works yard building had some areas of exterior stucco,
- Metal clad roofing was observed on the municipal hall and the main works yard buildings,
- Walls in all five building were finished with drywall,
- Fiberglass insulation was observed in the ceilings and walls of all five buildings,
- Some areas were left unfinished, (e.g., fire hall tower, storage, etc.),
- The main works yard building training room washroom was in a state of partial renovation,
- HVAC ducting in all five buildings contained various types of mastic,
- The buildings had aluminum framed widows -no putty,
- Flooring in the buildings survey consisted of carpet tile, vinyl sheet flooring, vinyl floor tile, bare wood, or concrete,
- Florescent lights were observed throughout all five buildings,
- No lead vents were observed at the time of survey,
- Underground fuel storage site was observed (on-site fuel dock),
- Several different miscellaneous chemicals were observed,
- No signs of mould in the building at the time of survey,
- No signs of hypodermic needles,
- Smoke detectors were observed onsite as well as a central fire alarm system.

4.0 ASBESTOS

Bulk samples of potential ACMs were collected for analysis during the HMI. BC Hazmat Inspections Inc. performed all bulk sample analysis of potential ACMs.

WorkSafeBC recommends a minimum number of bulk samples to be collected for each area of homogeneous material to confirm the presence or absence of asbestos under Polarized Light Microscopy (PLM) analysis.

Sampling required a small amount of material to be removed either from a damaged section of suspect material or cut from intact material and then repaired by sealing with tape to prevent fibre release. The collected samples were placed in plastic bags and sealed for shipment to BC Hazmat Inspections Inc. A formal chain of custody procedure was maintained between Antiquity and BC Hazmat Inspections Inc. during sample transport. Samples were then analyzed by BC Hazmat Inspections Inc. following NIOSH 9002 analytical procedures.

When conducting an HMI, it is standard practice to assume that certain building materials potentially contain asbestos. Depending on the material, this assumption is undertaken for one or more of the following reasons:

- The material is inaccessible (e.g., underground piping);
- There is an inherent danger in sampling the material (e.g., energized equipment);
- Limited sampling may not adequately reflect the extent of asbestos content; and
- Time constraints (i.e., attempting to isolate all possible ACMs within a building is not practical).

Therefore, for the purpose of this survey, Antiquity has assumed that the following materials are asbestos containing, where present:

- Asbestos cement products (i.e., transite board);
- HVAC duct tape
- Roof mastic;
- Mastic in any through wall and/or roof penetrations, on sinks, and behind older style tub surrounds (i.e. barker board);
- Drain pipe joint packing;
- Bell and spigot joint gaskets;
- Fire doors;
- Fire stop;
- High voltage wiring;
- Mechanical packing and gaskets;
- Underground services or piping.

Materials suspected to contain asbestos were delineated in each respective homogenous area (i.e., surfacing materials, thermal system insulation, miscellaneous materials, etc.) for sampling. Bulk samples of potential ACMs were submitted to BC Hazmat Inspections Inc. for analysis based on NIOSH 9002 analyzed on March 1st, 2017. Upon completion of the analysis, BC Hazmat Inspections Inc. provided Antiquity with the laboratory results. Floor plans are presented in Attachment A. Attachment B presents the results in addition to a copy of the laboratory cover letter.

5.0 METALS

Lead-based surface coatings are confirmed present on the exterior of four (4) of the five (5) buildings.

Three (3) samples were collected from the house which were submitted for lead content analysis (which included other metals). The sample was taken at the residence on site and transported via formal chain of custody process to B.C. Hazmat Inspections in Surrey, British Columbia for lead content analysis using EPA Method 6200; Metals in Soil Analysis Using Field Portable X-ray Fluorescence.

An excerpt of the analysis results was provided in a previous section of this report (end of Section 1.0). Detailed XRF analysis results have been provided at the end of Appendix B.

WSBC defines lead-containing surface coating materials in accordance with the Canadian Ministry of Health's Hazardous Product Act and the Surface Coating Materials Regulations (SOR/2005-109) under the Federal Hazardous Products Act. These Acts limit the definition of lead based paint to a "paint or other similar material that dries to a solid film that contains over 90 milligrams per kilogram (mg/kg; or 0.009%) dry weight of lead." Milligrams per kilogram is equivalent to parts per million (ppm). WSBC also suggests that the improper removal of paint containing more than 600 mg/kg or 600-ppm lead may result in airborne lead concentrations that exceed half of the occupational exposure limit (0.05 milligrams per cubic metre – mg/m^3).

6.0 OZONE DEPLETING SUBSTANCES (ODS)

Potential sources of ODSs were observed on site during the visual review at the survey area.

Several refrigerators in several lotions in the buildings.

In the province of B.C., the provincial regulatory framework providing the requirements for the safe management, storage, and disposal of ODS is BC Regulation 387/99, Ozone-Depleting Substances, and Other Halocarbons Regulation (ODSR), as amended by BC Reg.321/2004. According to the ODSR, a substance is considered to be ozone-depleting if it is listed as a Class I or Class II in Schedule A. Substances listed as Class III in Schedule A of the ODSR are not considered to be ozone-depleting.

7.0 PCBs

Florescent light ballasts were observed in all the buildings surveyed.

Any fluorescent light ballasts or potential PCB containing equipment, labels should be examined for the presence of PCBs – contractor to assume ballasts contain PCB unless explicitly described on ballast label something similar to "Does not Contain PCBS."

The Federal PCB Regulations (SOR/2008-273) provides standards for the handling, storage and disposal of PCB and equipment containing PCB under the Canadian Environmental Protection Act, 1999. The Regulation imposes deadlines for the elimination of all PCB and PCB-containing material currently in storage, and requires all other PCB to be phased out. Certain sections of the Regulation became effective as of December 31st, 2009. Subparagraph 16 (2) allows for light ballasts containing 50 mg/kg (ppm) PCB, or more, to remain in service until December 31st, 2025 if the equipment is in use on the day on which the regulations came into force. Equipment with a PCB concentration of between 2 mg/kg (ppm) and 50 mg/kg (ppm) may remain in service until the day that the liquid is drained from the equipment.

According to the Environment Canada's Reports EPS 2/CC/2 (revised) August 1991, Identification of Lamp Ballasts containing PCBs and Handbook on PCBs in Electrical Equipment, (Third Edition), PCB are generally associated with electrical equipment, such as transformers and fluorescent light ballasts, when manufactured before 1979.

The BC HWR (Part 1 – Interpretation and Application) defines PCB liquids and solids as liquid or material, respectively, that contains or is contaminated with chlorobiphenyls at a concentration greater than 50 parts per million (ppm) by weight of chlorobiphenyls. The BC HWR deals with requirements for the storage, transportation, treatment, recycling, and disposal of PCB wastes. Special handling procedures are not outlined by the BC HWR during the removal and disposal of materials containing PCB where the content of the material is below either 50 mg/kg (ppm) for a solid material, or 2 mg/kg (ppm) for a liquid.

Part 5 of the BC OHSR outlines the requirement to handle hazardous materials, including PCB, in the workplace.

8.0 MERCURY

No mercury containing equipment was observed during the time of inspection.

When taken out of service, mercury-containing equipment should be disposed of in accordance with the requirements of the BC MOE, and transported in accordance with the requirements of the Federal TDG Act and Regulation. Part 5 of the BC OHSR deals with requirements when handling hazardous materials, including mercury, in the workplace.

9.0 RADON

Testing for radon in the subject property was not conducted as part of this HMI. The coastal region of B.C. is considered a low risk area for radon gas and as sampling for radon and or progenies of radon is not deemed necessary.

The conditions and on-site building systems, including mechanical ventilation, limit the likelihood of radon gas accumulation.

Radon is an invisible, odourless radioactive gas formed by naturally occurring radioactive breakdown of uranium in soil, rock, and water. Radon escapes from the ground and mixes with outdoor air-forming concentrations that are too low to be of concern; however, if radon enters a building it can accumulate to higher levels which when inhaled with air are deposited in the lungs. Based on information presented by the Canadian Centre for occupational health and Safety, the area in which the site is located is not known to have elevated radon levels. Health Canada has developed guidelines for acceptable levels of radon in buildings; however, there are currently no regulations governing acceptable levels of radon within buildings, and no requirements for testing or mitigation if levels are found to exceed the current Health Canada guidelines.

10.0 RADIOACTIVE MATERIALS

Smoke detectors were observed in the buildings as well as a central fire alarm system.

Smoke detectors containing radioactive materials may be present within the survey area. An ionization smoke detector uses a radioisotope such as americium-241 to produce ionization in air; a difference due to smoke is detected and an alarm is generated. The presence of radioactive isotopes such as americium-241 means that every decommissioned smoke detector should be properly verified for such materials and disposed of appropriately.

Federal Nuclear Substances and Radiation Devices Regulation (SOR/2000-207) provide guidance for the safe handling, storage, and disposal of equipment containing radioactive materials under the Nuclear Safety and Control Act. Part 6 of this Regulation provides exemptions for smoke detectors meeting defined criteria. In the work place, radioactive materials are specifically regulated under Part 7 – Ionizing Radiation (Sections 7.17 to 7.25) of the BC OHSR. These regulations provide guidance for the safe handling, storage, and disposal of such materials.

11.0 UREA FORMALDEHYDE FOAM INSULATION

There were no signs of UFFI at the site.

Urea Formaldehyde Foam Insulation (UFFI) is composed of a mixture of urea-formaldehyde resin, a foaming agent, and compressed air. Injecting the foam in exterior wood frame and masonry walls in order to insulate difficult to reach cavities used it. It was primarily in use in residential construction from 1975 to 1978, though it was in-use in commercial and industrial developments to a lesser degree. During the mixing and curing of the insulation, as well as during its eventual deterioration, quantities of formaldehyde gas would be released into the air causing accumulation within the building. UFFI was banned in Canada in December 1980 as a precautionary measure to evaluate health concerns due to the off gassing of the formaldehyde gas. Recent studies performed in structures containing UFFI reported non-significant levels of interior formaldehyde gas.

Given these findings, and the timeframe since the ban of UFFI in Canada, structures still containing UFFI would most likely have low levels of formaldehyde and would be considered a low risk for health concerns to the occupants of these structures. No destructive testing was completed in order to verify the absence of UFFI within building structural components.

12.0 MOULD OR MICROBIAL CONTAMINATION

There no visible signs of mould in the building.

The presence of mould or other microbiological contamination in buildings has become a concern to building tenants and owners due to potential health effects on occupants and users. Provincial Ministries of Labour have recently issued guidelines on enforced regulations to protect the health of construction workers who are exposed to mould in the course of building renovations. The presence of water leaks or high humidity can cause the growth or amplification of mould within building environments.

A comprehensive inspection for mould, which would require intrusive testing was not performed as part of this HMI Survey. However, visible mould/water-damaged areas were observed at the time of the Site visit.

13.0 MISCELLANEOUS CHEMICALS

Miscellaneous chemicals were observed on site at the time of the survey which include; petroleum products, various shop chemicals, paint materials and cleaning products.

14.0 OTHER BIOLOGICAL HAZARDS / RODENT DROPPINGS

AECL staff did not observe rodent droppings, hypodermic needles, or any other potential biohazards.

15.0 RECOMMENDATIONS

Based on the results of this HMI, the following measures are recommended at the Site:

Prior to beginning any demolition or renovation work that may impinge upon any asbestos containing materials or other hazardous materials within the building, the following is recommended:

1. **Lead-based surface coatings are confirmed present on the exterior wood siding throughout the outside perimeter of the fire hall and municipal hall. Other areas include the main works yard exterior stair wells and steel support beams of the utilities building.** Should these areas be modified or disturbed, moderate-risk lead abatement procedures must be adhered to as described in WorkSafe BC's publication: ***Lead-Containing Paints and Coatings; Preventing Exposure in the Construction Industry (2011)***. A TCLP test is recommended on building material prior to disposal at landfill destination.

2. Florescent lights were observed in the building – the fluorescent light ballasts should be inspected for the potential presence of PCBs and are to be removed from the site in a safe and regulated manner.

3. If any suspect asbestos containing materials are encountered in the garage, attic, within walls, above ceilings, or under floors during demolition/renovation activities that are not addressed in this report, the work in the immediate area is to be stopped and the supervisor informed of the findings. The supervisor is to contact Antiquity Environmental Consulting Ltd. for further directions and potentially update the hazardous material assessment if the materials are found to be asbestos containing. Should this occur an amended report with updated lab samples will be provided to the abatement contractor.

If requested, Antiquity may complete a final review of the work areas following removal of hazardous materials, to document removal in accordance with regulatory requirements.

16.0 CLOSURE

The use of this report is subject to the Statement of Limitations presented in Appendix D of this report. The reader's attention is specifically drawn to the Statement of Limitations as it is considered essential that they be followed for the proper use and interpretation of this report. If you have any questions regarding this report, please contact the undersigned.

Sincerely,

Antiquity Environmental Consulting Ltd.

Survey Completed by:

Chris Jenkins, ABI

Brendan Getty

Reviewed by:

Trevor Getty, ROH, CIH, CPHI (c), CRSP, ABI

Attachments (4):

17.0	Appendix A – Site Schematics
18.0	Appendix B – Laboratory Results & Cover Letter
19.0	Appendix C – Site Pictures
20.0	Appendix D – Statement of Limitations

17.0 Appendix A – Site Location, Sample Locations & Schematics

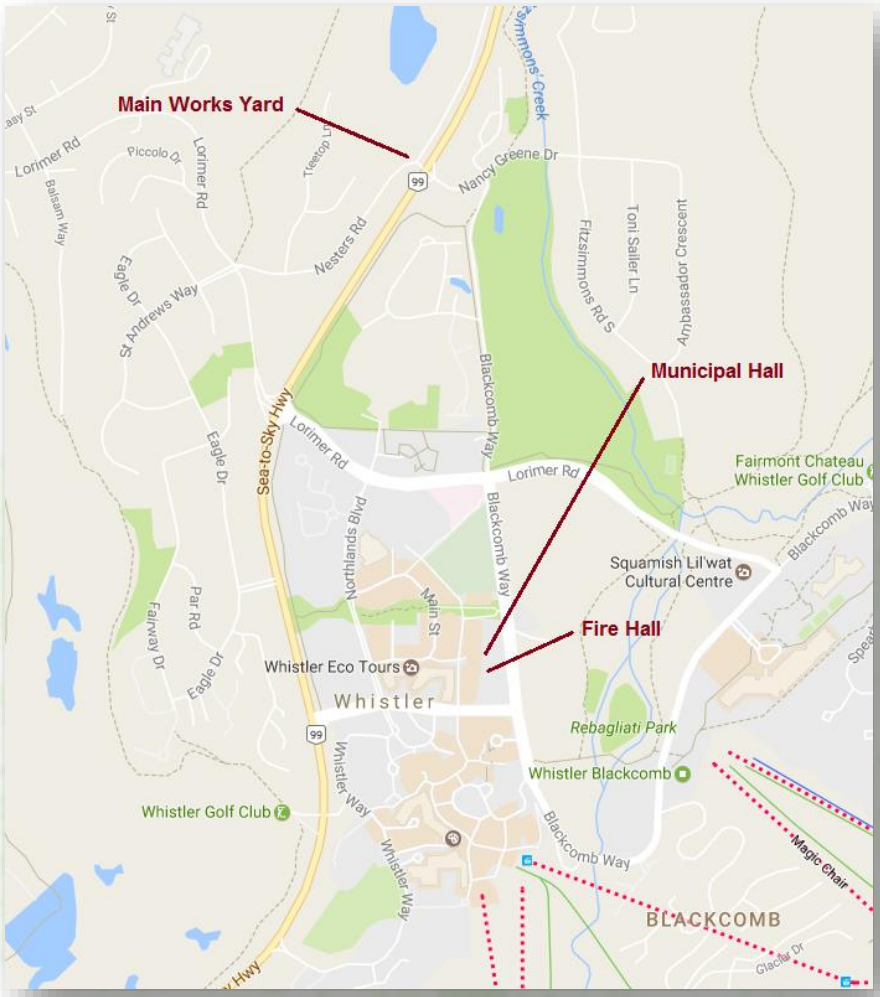

Figure A1 – Site Locations Map

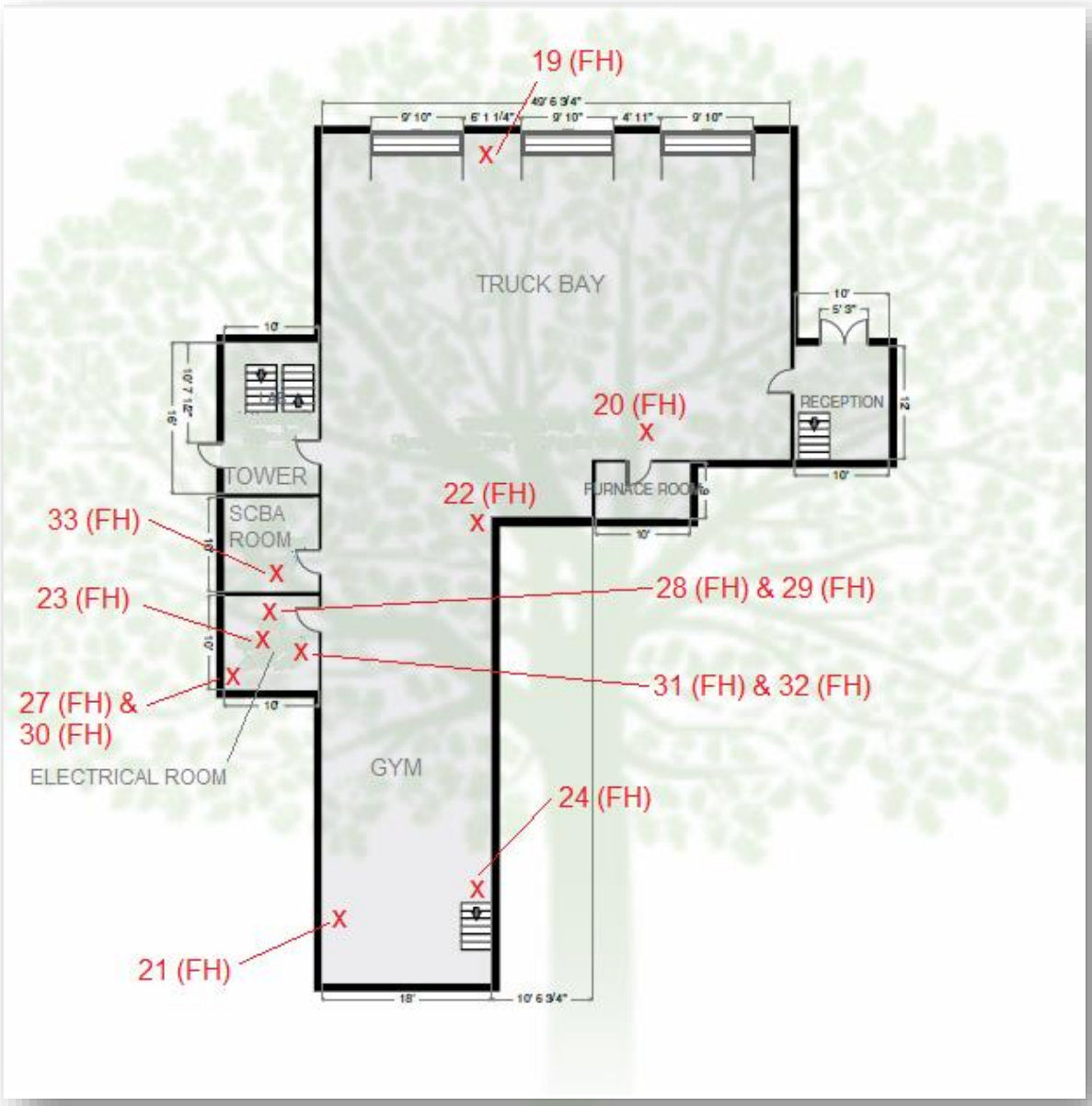

Figure A2 – Map of sample locations taken from the 1st floor of the fire hall.

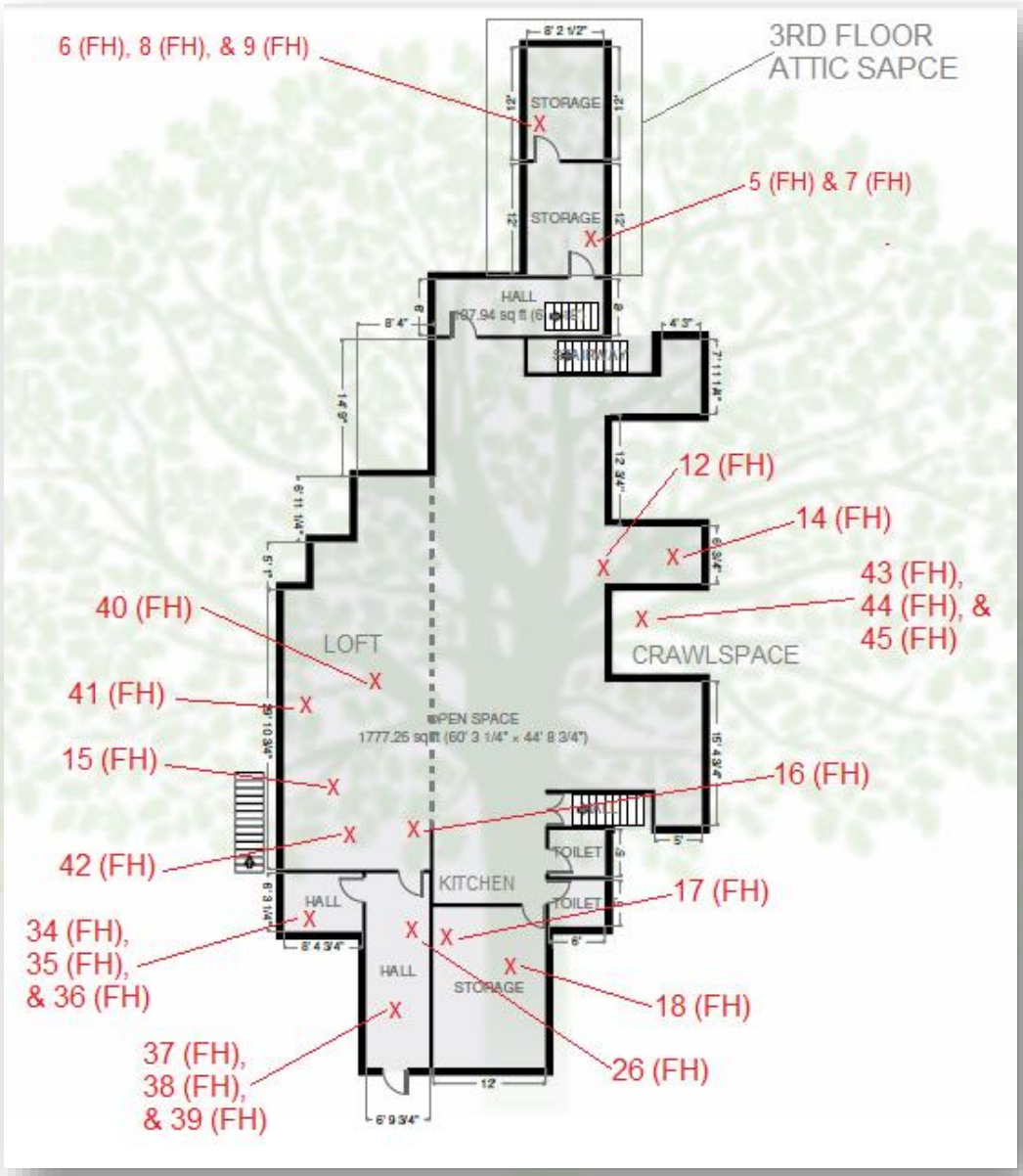

Figure A3 – Map of sample locations taken from the 2nd floor of the fire hall

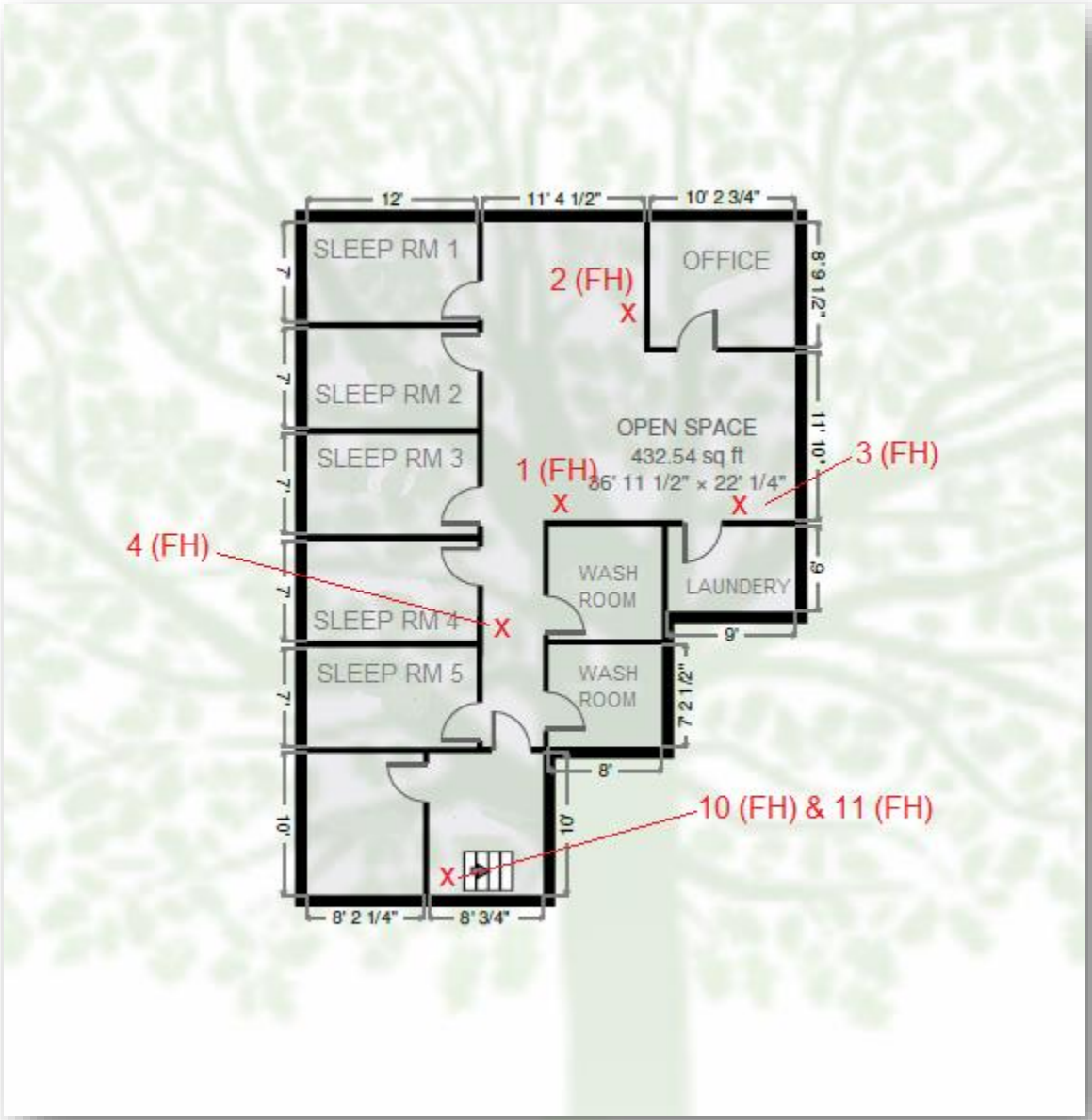

Figure A4 – Map of sample locations taken from the 3rd floor of the fire hall.

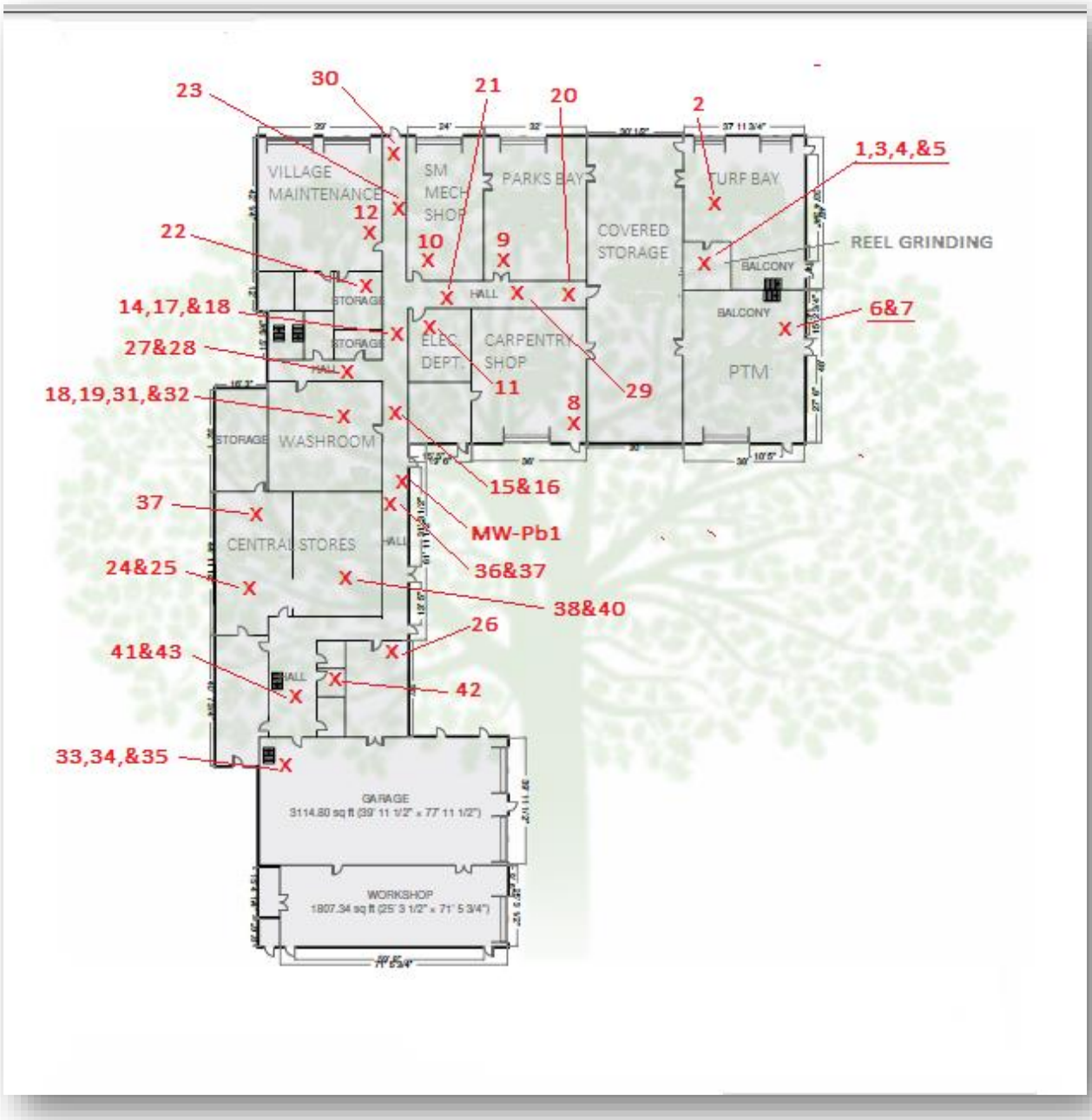

Figure A5 – Map of sample locations taken from the 1st floor of the main works building.

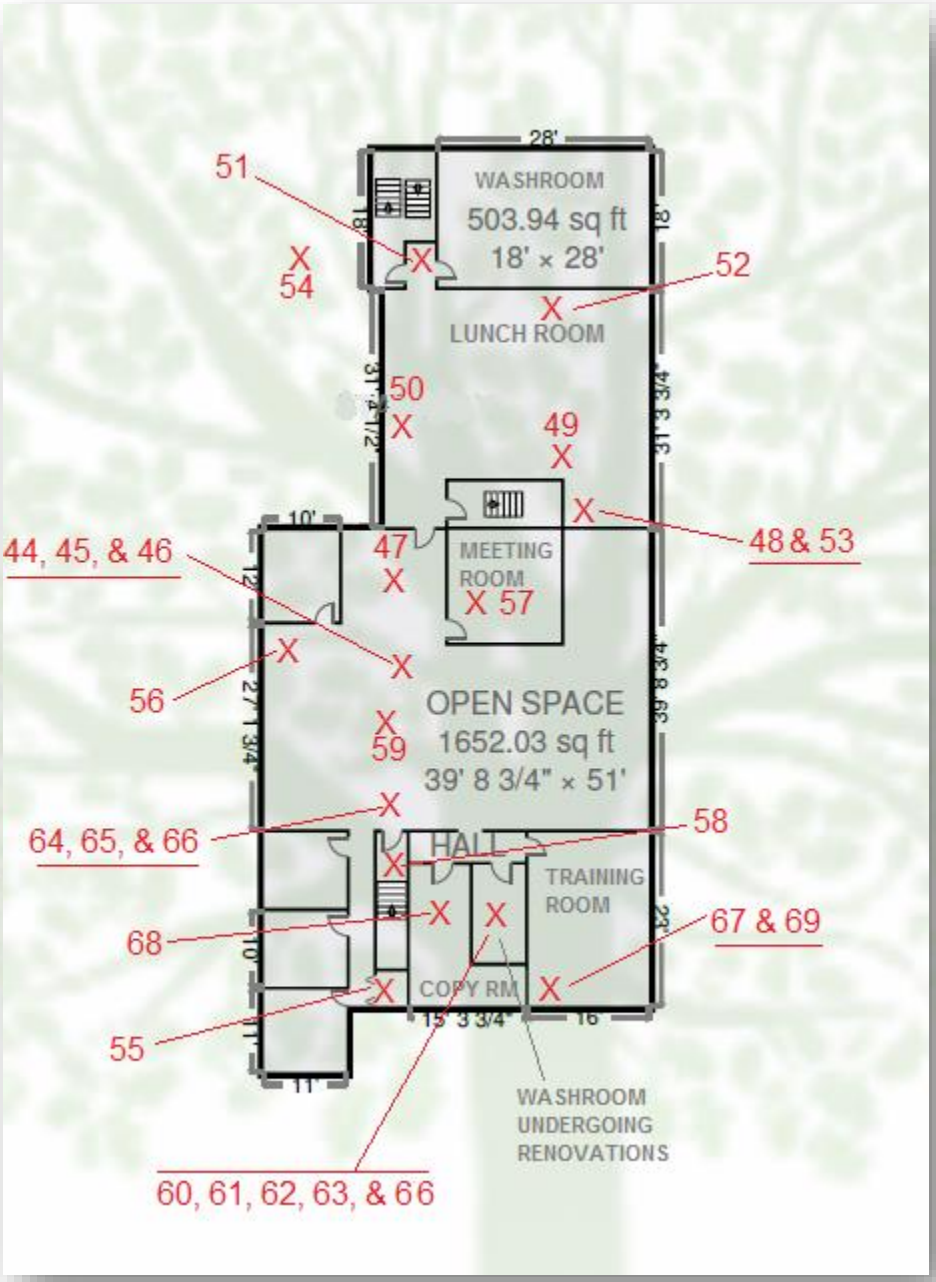

Figure A6 – Map of sample locations taken from the 2nd floor of the main works building.

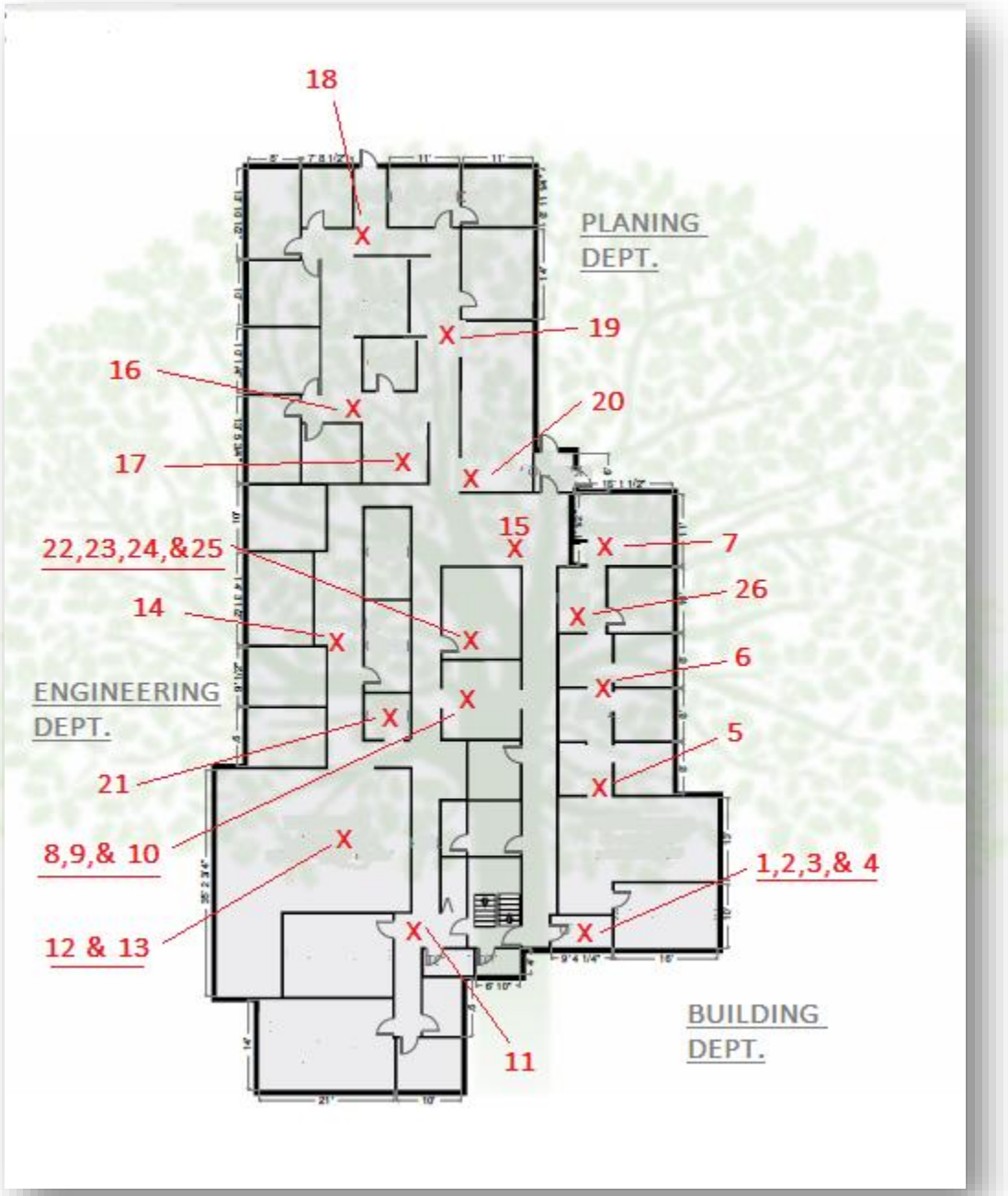

Figure A7 – Map of sample locations taken from the 1st floor of the municipal hall.

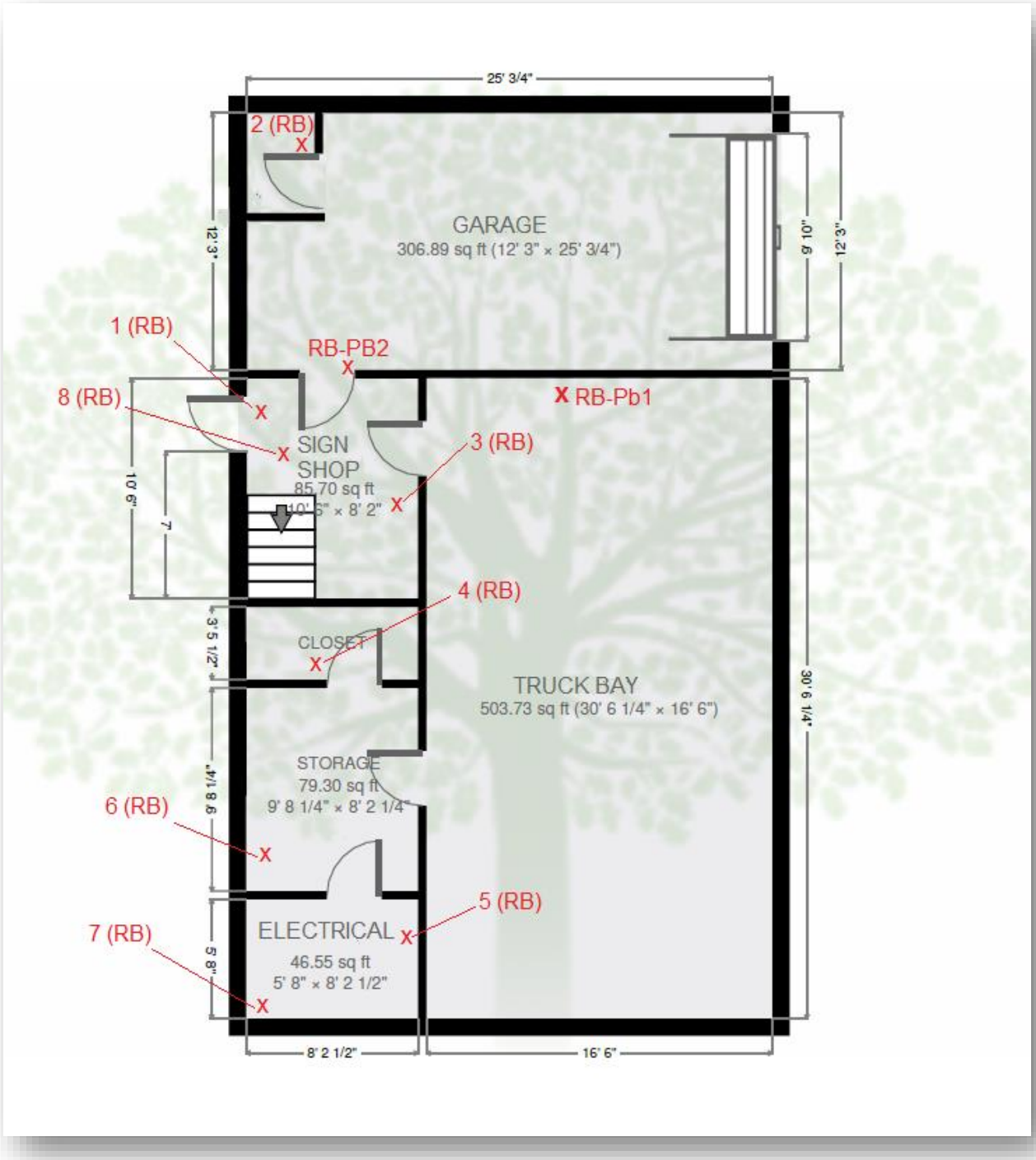

Figure A8 – Map of sample locations taken from the 1st floor of the roads building.

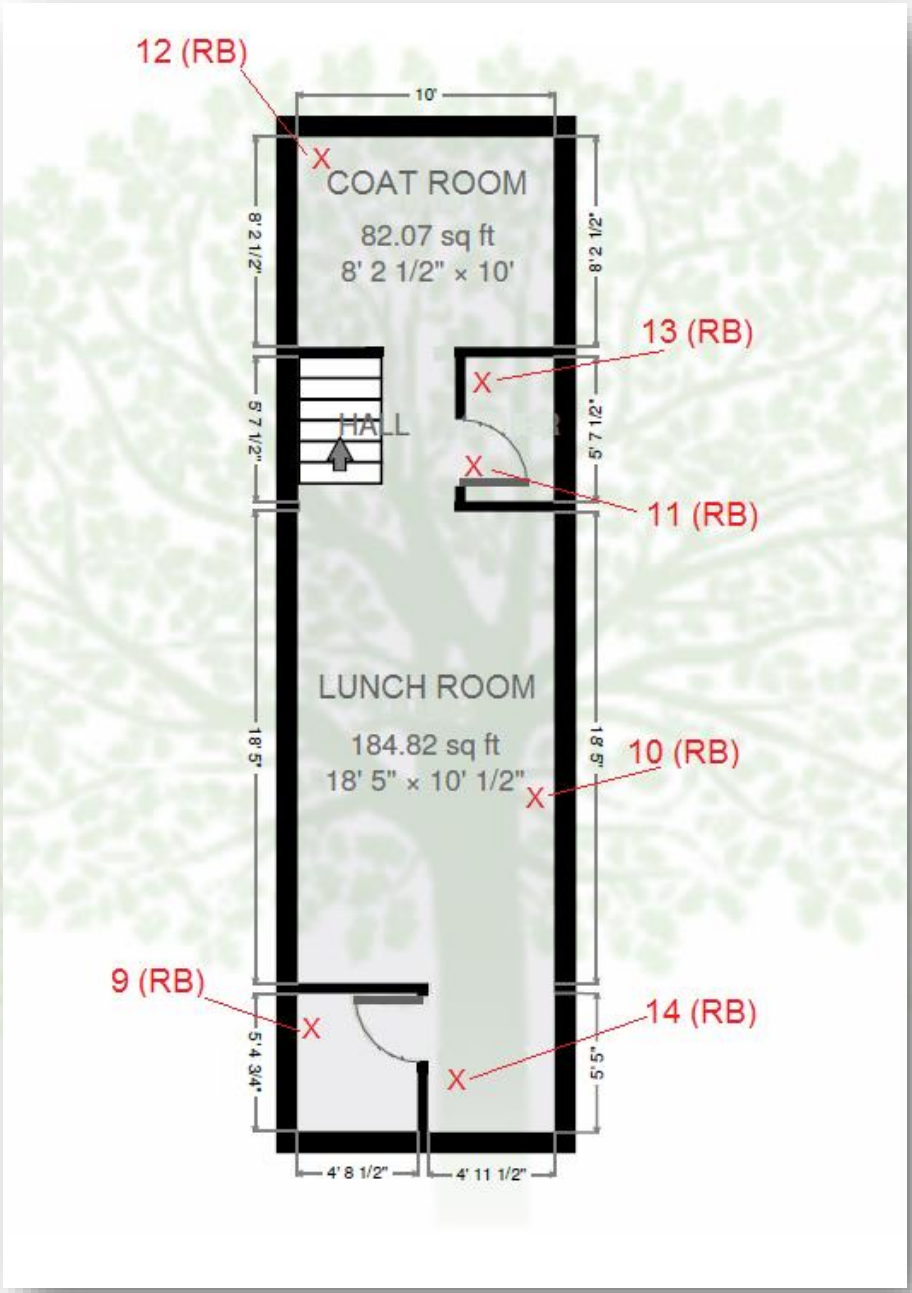

Figure A9 – Map of sample locations taken from the 2nd floor of the roads building.

Figure A10 – Map of sample locations taken from the 1st floor of the utilities building and archives.

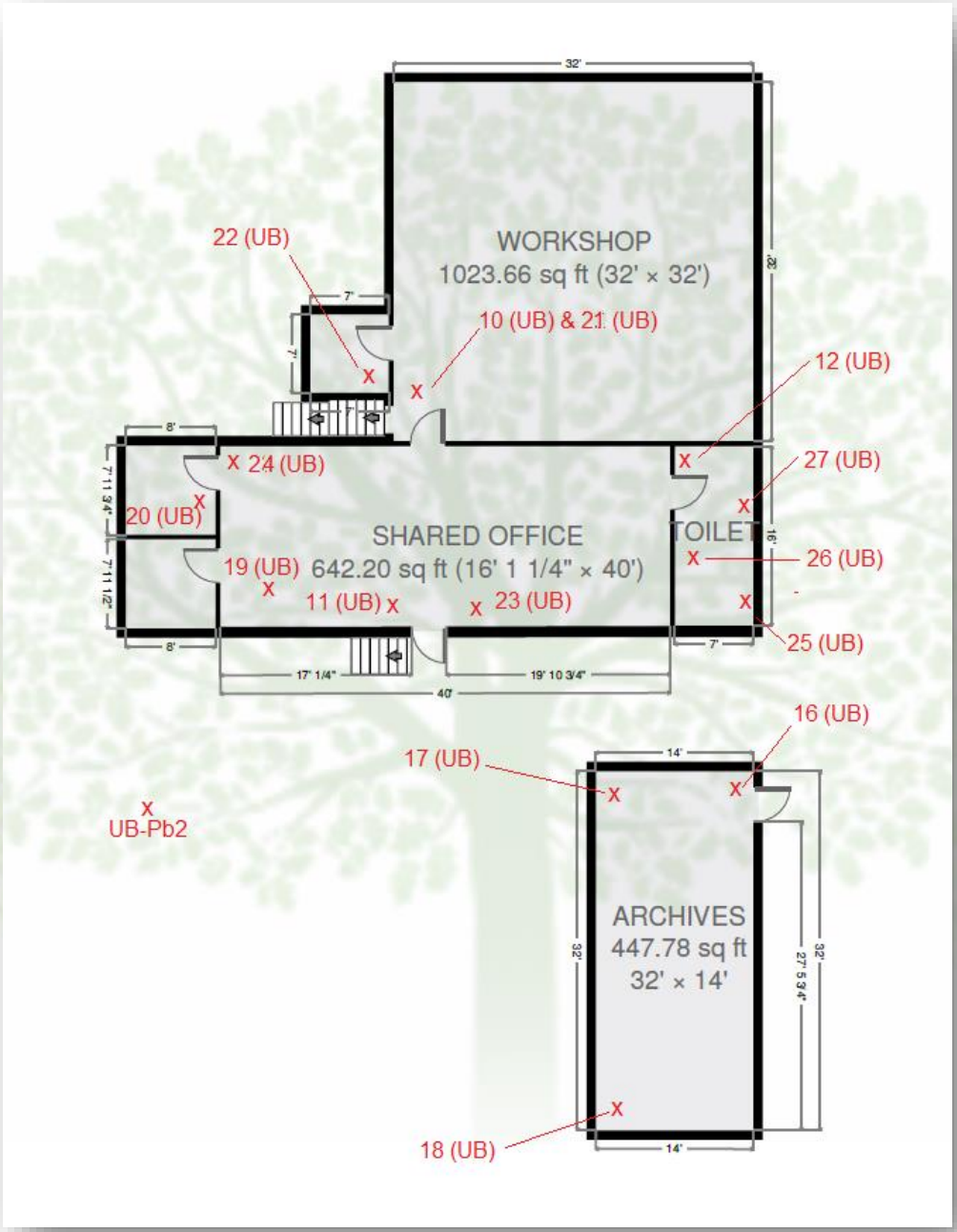

Figure A11 – Map of sample locations taken from the 2nd floor of the utilities building and archives.

18.0 Appendix B – Laboratory Results

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MARCH 9/2017

The 44 samples submitted for your project ID #11064 for site: "4315 Blackcomb way, Whistler, BC", have been analyzed. The following page(s) contain the Bulk Asbestos Identification Results for your project.

The samples were analyzed by the NIOSH (National Institute for Occupational Safety and Health) Method 9002, using stereo binocular microscopy and polarized light microscopy. Coast BC Hazmat Inspections INC. participates in EPA (Environmental Protection Agency) Test Method for Determination of Asbestos in Bulk Building Materials. Coast BC Hazmat Inspections Inc. participates in the AIHA bulk asbestos proficiency analytical testing program, participant number 223436. All samples will be retained for three months after analysis. Results relate only to the items tested.

If you have any questions or comments, please contact us.

Respectively,

Lab. Analyst: Caitlin Paulson
cc…Coast BC Hazmat Inspections Inc.

SERVICES: Hazardous Material Inspections, Consulting, Abatement, & Air Monitoring
Laboratory Services: Asbestos Bulk Sample Analysis, Air Monitoring Analysis

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CLIENT ID: Resort Municipality of Whistler
SAMPLES SUBMITTED BY: Chris/ Brendan
LOCATION: 4315 Blackcomb way, Whistler, BC
DATE ANALYZED: March 9/2017
BCHI ID: 11064

BULK ASBESTOS RESULTS

BCHI SAMPLE ID	CLIENT SAMPLE ID	SAMPLE LOCATION	MATERIAL TYPE	LAYER #	LAYER DESCRIPTION	OTHER MATERIAL & AMOUNT	ASBESTOS TYPE & AMOUNT
11064-1	1 FH	Third floor open office Wall	Drywall filler compound	1	Filler compound	Non fibrous>99%	Not Detected
11064-2	2 FH	Third floor open office Floor	Mastic	1	Yellow mastic	Cellulose 5% Non fibrous 95%	Not Detected
11064-3	3 FH	Third floor open office Floor	Mastic	1	Yellow mastic	Cellulose 5% Non fibrous 95%	Not Detected
11064-4	4 FH	Third floor open office hall Wall	Drywall filler compound	1	Filler compound	Non fibrous>99%	Not Detected
11064-5	5 FH	Third floor attic storage Wall	Drywall filler compound	1	Paper (No filler compound)	Cellulose 90% Non fibrous 10%	Not Detected
11064-6	6 FH	Third floor attic Duct	Mastic	1	White mastic	Synthetic 5% Non fibrous 95%	Not Detected
11064-7	7 FH	Third floor attic storage Ceiling	Drywall filler compound	1	Filler compound	Non fibrous>99%	Not Detected
11064-8	8 FH	Third floor attic Duct	Mastic	1	White mastic	Synthetic 5% Non fibrous 95%	Not Detected

Analytical Method: NIOSH 9002 Analyst: Caitlin Paulson

Coast BC Hazmat Inspections Inc. participates in the AIHA bulk asbestos proficiency analytical testing program, participant number 223436

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BULK ASBESTOS RESULTS

BCHI SAMPLE ID	CLIENT SAMPLE ID	SAMPLE LOCATION	MATERIAL TYPE	LAYER #	LAYER DESCRIPTION	OTHER MATERIAL & AMOUNT	ASBESTOS TYPE & AMOUNT
11064-9	9 FH	Third floor attic Duct	Mastic	1	White mastic	Synthetic 5% Non fibrous 95%	Not Detected
11064-10	10 FH	Third floor stair landing Floor	Vinyl tile	1	Blue tile	Non fibrous>99%	Not Detected
11064-11	11 FH	Third floor stair landing Floor	Vinyl tile	1	Green tile	Non fibrous>99%	Not Detected
11064-12	12 FH	Second floor lounge Ceiling	Drywall filler compound	1	Filler compound	Non fibrous>99%	Not Detected
11064-13	13 FH	Second floor lounge Wall	Drywall filler compound	1	Filler compound	Non fibrous>99%	Not Detected
11064-14	14 FH	Second floor lounge Floor	Mastic	1	Yellow mastic	Cellulose 5% Non fibrous95%	Not Detected
				2	Leveling compound	Non fibrous>99%	Not Detected
11064-15	15 FH	Second floor lounge Floor	Vinyl tile	1	Green tile	Cellulose 10% Non fibrous 90%	Not Detected

Analytical Method: NIOSH 9002 Analyst: Caitlin Paulson

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				2	Mesh	Cellulose>99%	Not Detected
11064-16	16 FH	Second floor lounge Floor	Mastic	1	Yellow mastic	Cellulose 5% Non fibrous95%	Not Detected
				2	Leveling compound	Non fibrous>99%	Not Detected
11064-17	17 FH	Second floor kitchen storage Wall	Drywall filler compound	1	Filler compound	Non fibrous>99%	Not Detected
11064-18	18 FH	Second floor kitchen storage Ceiling	Drywall filler compound	1	Filler compound	Non fibrous>99%	Not Detected
11064-19	19 FH	First floor truck bay Wall	Drywall filler compound	1	Filler compound	Non fibrous>99%	Not Detected
11064-20	20 FH	First floor truck bay Ceiling	Drywall filler compound	1	Filler compound	Non fibrous>99%	Not Detected
11064-21	21 FH	First floor gym Wall	Drywall filler compound	1	Filler compound	Non fibrous>99%	Not Detected

Analytical Method: NIOSH 9002 Analyst: Caitlin Paulson

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BCHI ID: 11064

BULK ASBESTOS RESULTS

BCHI SAMPLE ID	CLIENT SAMPLE ID	SAMPLE LOCATION	MATERIAL TYPE	LAYER #	LAYER DESCRIPTION	OTHER MATERIAL & AMOUNT	ASBESTOS TYPE & AMOUNT
11064-22	22 FH	First floor truck bay Wall	Drywall filler compound	1	Filler compound	Non fibrous>99%	Not Detected
11064-23	23 FH	First floor electrical room Ceiling	Drywall filler compound	1	Filler compound	Non fibrous>99%	Not Detected
11064-24	24 FH	First floor truck bay stairs Ceiling	Drywall filler compound	1	Filler compound	Non fibrous>99%	Not Detected
11064-25	25 FH						No Sample
11064-26	26 FH	Second floor hall Floor	Mastic	1	Yellow mastic	Cellulose 5% Non fibrous 95%	Not Detected
11064-27	27 FH	First floor electrical room Ceiling	Mastic	1	Red mastic	Non fibrous>99%	Not Detected
11064-28	28 FH	First floor electrical room Wall	Mastic	1	Red mastic	Non fibrous>99%	Not Detected
11064-29	29 FH	First floor electrical room Wall	Mastic	1	Grey mastic	Non fibrous>99%	Not Detected

Analytical Method: NIOSH 9002 Analyst: Caitlin Paulson

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BCHI ID: 11064

BULK ASBESTOS RESULTS

BCHI SAMPLE ID	CLIENT SAMPLE ID	SAMPLE LOCATION	MATERIAL TYPE	LAYER #	LAYER DESCRIPTION	OTHER MATERIAL & AMOUNT	ASBESTOS TYPE & AMOUNT
11064-30	30 FH	First floor electrical room Ceiling	Mastic	1	Red mastic	Non fibrous>99%	Not Detected
11064-31	31 FH	First floor electrical room Ceiling	Mastic	1	Grey mastic	Non fibrous>99%	Not Detected
11064-32	32 FH	First floor electrical room Ceiling	Mastic	1	Grey mastic	Non fibrous>99%	Not Detected
11064-33	33 FH	First floor SCBA room Floor	Peel and Stick	1	Vinyl top	Non fibrous>99%	Not Detected
				2	White tile	Non fibrous>99%	Not Detected
11064-34	34 FH	Second floor stairwell Ceiling	Acoustic tile	1	Fibrous tile	Cellulose 50% Non fibrous 50%	Not Detected
11064-35	35 FH	Second floor stairwell Ceiling	Acoustic tile	1	Fibrous tile	Cellulose 50% Non fibrous 50%	Not Detected
11064-36	36 FH	Second floor stairwell Ceiling	Acoustic tile	1	Fibrous tile	Cellulose 50% Non fibrous 50%	Not Detected

Analytical Method: NIOSH 9002 Analyst: Caitlin Paulson

Coast BC Hazmat Inspections Inc. participates in the AIHA bulk asbestos proficiency analytical testing program, participant number 223436

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DATE ANALYZED: March 9/2017
BCHI ID: 11064

BULK ASBESTOS RESULTS

BCHI SAMPLE ID	CLIENT SAMPLE ID	SAMPLE LOCATION	MATERIAL TYPE	LAYER #	LAYER DESCRIPTION	OTHER MATERIAL & AMOUNT	ASBESTOS TYPE & AMOUNT
11064-37	37 FH	Second floor rear hall exit Ceiling	Acoustic tile	1	Fibrous tile	Cellulose 50% Non fibrous 50%	Not Detected
11064-38	38 FH	Second floor rear hall exit Ceiling	Acoustic tile	1	Fibrous tile	Cellulose 50% Non fibrous 50%	Not Detected
11064-39	39 FH	Second floor rear hall exit Ceiling	Acoustic tile	1	Fibrous tile	Cellulose 50% Non fibrous 50%	Not Detected
11064-40	40 FH	Second floor loft Ceiling	Texture coat	1	Texture coat	Cellulose 5-10% Non fibrous 90%	Not Detected
11064-41	41 FH	Second floor loft Ceiling	Texture coat	1	Texture coat	Cellulose 5-10% Non fibrous 90%	Not Detected
11064-42	42 FH	Second floor loft Ceiling	Texture coat	1	Texture coat	Cellulose 5-10% Non fibrous 90%	Not Detected
11064-43	43 FH	Second floor lounge crawlspace Duct	Mastic	1	Grey mastic	Synthetic 5% Non fibrous 95%	Not Detected
11064-44	44 FH	Second floor lounge crawlspace Duct	Mastic	1	Grey mastic	Synthetic 5% Non fibrous 95%	Not Detected

Analytical Method: NIOSH 9002 Analyst: Caitlin Paulson

Coast BC Hazmat Inspections Inc. participates in the AIHA bulk asbestos proficiency analytical testing program, participant number 223436

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SURREY, BC V3W 8J9

CLIENT ID: Resort Municipality of Whistler
SAMPLES SUBMITTED BY: Chris/ Brendan
LOCATION: 4315 Blackcomb way, Whistler, BC
DATE ANALYZED: March 9/2017
BCHI ID: 11064

BULK ASBESTOS RESULTS

BCHI SAMPLE ID	CLIENT SAMPLE ID	SAMPLE LOCATION	MATERIAL TYPE	LAYER #	LAYER DESCRIPTION	OTHER MATERIAL & AMOUNT	ASBESTOS TYPE & AMOUNT
11064-45	45 FH	Second floor lounge crawlspace Duct	Mastic	1	Grey mastic	Synthetic 5% Non fibrous 95%	Not Detected

Analytical Method: NIOSH 9002 Analyst: Caitlin Paulson

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MARCH 8/2017

The 69 samples submitted for your project ID #11051 for site: "8020 Nesters Road, Whistler, B.C.", have been analyzed. The following page(s) contain the Bulk Asbestos Identification Results for your project.

The samples were analyzed by the NIOSH (National Institute for Occupational Safety and Health) Method 9002, using stereo binocular microscopy and polarized light microscopy. Coast BC Hazmat Inspections INC. participates in EPA (Environmental Protection Agency) Test Method for Determination of Asbestos in Bulk Building Materials. Coast BC Hazmat Inspections Inc. participates in the AIHA bulk asbestos proficiency analytical testing program, participant number 223436. All samples will be retained for three months after analysis. Results relate only to the items tested.

If you have any questions or comments, please contact us.

Respectively,

Lab. Analyst: Ben Wang
cc...Coast BC Hazmat Inspections Inc.

SERVICES: Hazardous Material Inspections, Consulting, Abatement, & Air Monitoring
Laboratory Services: Asbestos Bulk Sample Analysis, Air Monitoring Analysis

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CLIENT ID: Antiquity (Resort Municipality of Whistler)
SAMPLES SUBMITTED BY: Chris/Brendan
LOCATION: 8020 Nesters Road, Whistler
DATE ANALYZED: March 8/2017
BCHI ID: 11051

BULK ASBESTOS RESULTS

BCHI SAMPLE ID	CLIENT SAMPLE ID	SAMPLE LOCATION	MATERIAL TYPE	LAYER #	LAYER DESCRIPTION	OTHER MATERIAL & AMOUNT	ASBESTOS TYPE & AMOUNT
11051-1	1	Main 1st Floor Reel Grinding Wall	Drywall Filler Compound	1	Filler Compound	Cellulose-5% Non Fibrous-95%	Not Detected
11051-2	2	Main 1st Floor Turf Bay Wall	Drywall Filler Compound	1	Filler Compound	Cellulose-5% Non Fibrous-95%	Not Detected
11051-3	3	Main 1st Floor Reel Grinding Duct	Mastic	1	Grey Mastic	Cellulose-2% Non Fibrous-98%	Not Detected
11051-4	4	Main 1st Floor Reel Grinding Duct	Mastic	1	Grey Mastic	Cellulose-2% Non Fibrous-98%	Not Detected
11051-5	5	Main 1st Floor Reel Grinding Duct	Mastic	1	Grey Mastic	Cellulose-2% Non Fibrous-98%	Not Detected
11051-6	6	Main 1st Floor PTM Wall	Drywall Filler Compound	1	Filler Compound	Cellulose-5% Non Fibrous-95%	Not Detected
11051-7	7	Main 2nd Floor PTM Wall	Drywall Filler Compound	1	Filler Compound	Cellulose-5% Non Fibrous-95%	Not Detected
11051-8	8	Main 1st Floor Carpenter Shop Wall	Drywall Filler Compound	1	Filler Compound	Cellulose-5% Non Fibrous-95%	Not Detected

Analytical Method: NIOSH 9002 Analyst: Ben Wang

Coast BC Hazmat Inspections Inc. participates in the AIHA bulk asbestos proficiency analytical testing program, participant number 223436

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CLIENT ID: Antiquity (Resort Municipality of Whistler)
SAMPLES SUBMITTED BY: Chris/Brendan
LOCATION: 8020 Nesters Road, Whistler
DATE ANALYZED: March 8/2017
BCHI ID: 11051

BULK ASBESTOS RESULTS

BCHI SAMPLE ID	CLIENT SAMPLE ID	SAMPLE LOCATION	MATERIAL TYPE	LAYER #	LAYER DESCRIPTION	OTHER MATERIAL & AMOUNT	ASBESTOS TYPE & AMOUNT
11051-9	9	Main 1st Floor Parks Shop Wall	Drywall Filler Compound	1	Filler Compound	Cellulose-5% Non Fibrous-95%	Not Detected
11051-10	10	Main 1st Floor Sm. Mech. Shop Wall	Drywall Filler Compound	1	Filler Compound	Cellulose-5% Non Fibrous-95%	Not Detected
11051-11	11	Main 1st Floor Electrical Dept. Wall	Drywall Filler Compound	1	Filler Compound	Cellulose-5% Non Fibrous-95%	Not Detected
11051-12	12	Main 1st Floor Village Maintenance Wall	Drywall Filler Compound	1	Filler Compound	Cellulose-5% Non Fibrous-95%	Not Detected
11051-13	13	Main 1st Floor Hallway Wall	Drywall Filler Compound	1	Filler Compound	Cellulose-5% Non Fibrous-95%	Not Detected
11051-14	14	Main 1st Floor Hallway Ceiling	Drywall Filler Compound	1	Filler Compound	Cellulose-5% Non Fibrous-95%	Not Detected
11051-15	15	Main 1st Floor Hallway Ceiling	Drywall Filler Compound	1	Filler Compound	Cellulose-5% Non Fibrous-95%	Not Detected
11051-16	16	Main 1st Floor Hallway Ceiling	Drywall Filler Compound	1	Filler Compound	Cellulose-5% Non Fibrous-95%	Not Detected

Analytical Method: NIOSH 9002 Analyst: Ben Wang

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CLIENT ID: Antiquity (Resort Municipality of Whistler)
SAMPLES SUBMITTED BY: Chris/Brendan
LOCATION: 8020 Nesters Road, Whistler
DATE ANALYZED: March 8/2017
BCHI ID: 11051

BULK ASBESTOS RESULTS

BCHI SAMPLE ID	CLIENT SAMPLE ID	SAMPLE LOCATION	MATERIAL TYPE	LAYER #	LAYER DESCRIPTION	OTHER MATERIAL & AMOUNT	ASBESTOS TYPE & AMOUNT
11051-17	17	Main 1st Floor Hallway Ceiling	Acoustic Tile	1	Fibrous Tile	Cellulose-40% Non Fibrous-60%	Not Detected
11051-18	18	Main 1st Floor Bathroom Wall	Drywall Filler Compound	1	Filler Compound	Cellulose-5% Non Fibrous-95%	Not Detected
11051-19	19	Main 1st Floor Bathroom Floor	Vinyl Sheet	1	Vinyl Top	Cellulose-2% Non Fibrous-98%	Not Detected
				2	Backing	Fibreglass-10% Non Fibrous-90%	Not Detected
11051-20	20	Main 1st Floor Hallway Ceiling	Texture Coat	1	Texture Coat	Cellulose-10% Non Fibrous-90%	Not Detected
				2	Filler Compound	Cellulose-5% Non Fibrous-95%	Not Detected
11051-21	21	Main 1st Floor Hall Ceiling	Texture Coat	1	Texture Coat	Cellulose-10% Non Fibrous-90%	Not Detected
11051-22	22	Main 1st Floor Village Maintenance Storage, Ceiling	Texture Coat	1	Texture Coat	Cellulose-10% Non Fibrous-90%	Not Detected

Analytical Method: NIOSH 9002 Analyst: Ben Wang

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CLIENT ID: Antiquity (Resort Municipality of Whistler)
SAMPLES SUBMITTED BY: Chris/Brendan
LOCATION: 8020 Nesters Road, Whistler
DATE ANALYZED: March 8/2017
BCHI ID: 11051

BULK ASBESTOS RESULTS

BCHI SAMPLE ID	CLIENT SAMPLE ID	SAMPLE LOCATION	MATERIAL TYPE	LAYER #	LAYER DESCRIPTION	OTHER MATERIAL & AMOUNT	ASBESTOS TYPE & AMOUNT
11051-23	23	Main 1st Floor Hall Ceiling	Drywall Filler Compound	1	Filler Compound	Cellulose-5% Non Fibrous-95%	Not Detected
11051-24	24	Main 1st Floor Central Stores Wall	Drywall Filler Compound	1	Filler Compound	Cellulose-5% Non Fibrous-95%	Not Detected
11051-25	25	Main 1st Floor Central Stores Wall	Drywall Filler Compound	1	Filler Compound	Cellulose-5% Non Fibrous-95%	Not Detected
11051-26	26	Main 1st Floor Shop Office Wall	Drywall Filler Compound	1	Filler Compound	Cellulose-5% Non Fibrous-95%	Not Detected
11051-27	27	Main 1st Floor Hall Ceiling	Drywall Filler Compound	1	Filler Compound	Cellulose-5% Non Fibrous-95%	Not Detected
11051-28	28	Main 1st Floor Hall Ceiling	Acoustic Tile	1	Fibrous Tile	Cellulose-40% Non Fibrous-60%	Not Detected
11051-29	29	Main 1st Floor Hall Ceiling	Texture Coat	1	Texture Coat	Cellulose-10% Non Fibrous-90%	Not Detected
11051-30	30	Main 1st Floor Hall Ceiling	Texture Coat	1	Texture Coat	Cellulose-10% Non Fibrous-90%	Not Detected

Analytical Method: NIOSH 9002 Analyst: Ben Wang

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LOCATION: 8020 Nesters Road, Whistler
DATE ANALYZED: March 8/2017
BCHI ID: 11051

BULK ASBESTOS RESULTS

BCHI SAMPLE ID	CLIENT SAMPLE ID	SAMPLE LOCATION	MATERIAL TYPE	LAYER #	LAYER DESCRIPTION	OTHER MATERIAL & AMOUNT	ASBESTOS TYPE & AMOUNT
11051-31	31	Main 1st Floor Washroom Ceiling	Acoustic Tile	1	Fibrous Tile	Cellulose-40% Non Fibrous-60%	Not Detected
11051-32	32	Main 1st Floor Washroom Ceiling	Drywall Filler Compound	1	Filler Compound	Cellulose-5% Non Fibrous-95%	Not Detected
11051-33	33	Main 2nd Floor Mech. Shop Duct	Mastic	1	Black/Green Mastic	Cellulose-2% Non Fibrous-98%	Not Detected
11051-34	34	Main 2nd Floor Mech. Shop Duct	Mastic	1	Black/Green Mastic	Cellulose-2% Non Fibrous-98%	Not Detected
11051-35	35	Main 2nd Floor Mech. Shop Duct	Mastic	1	Black/Green Mastic	Cellulose-2% Non Fibrous-98%	Not Detected
11051-36	36	Main 1st Floor Hall Ceiling	Texture Coat	1	Texture Coat	Cellulose-10% Non Fibrous-90%	Not Detected
11051-37	37	Main 1st Floor General Stores Ceiling	Texture Coat	1	Texture Coat	Cellulose-10% Non Fibrous-90%	Not Detected
11051-38	38	Main 1st Floor General Stores Ceiling	Texture Coat	1	Texture Coat	Cellulose-10% Non Fibrous-90%	Not Detected

Analytical Method: NIOSH 9002 Analyst: Ben Wang

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SAMPLES SUBMITTED BY: Chris/Brendan
LOCATION: 8020 Nesters Road, Whistler
DATE ANALYZED: March 8/2017
BCHI ID: 11051

BULK ASBESTOS RESULTS

BCHI SAMPLE ID	CLIENT SAMPLE ID	SAMPLE LOCATION	MATERIAL TYPE	LAYER #	LAYER DESCRIPTION	OTHER MATERIAL & AMOUNT	ASBESTOS TYPE & AMOUNT
11051-39	39	Main 1st Floor Stairs Floor	Vinyl Tile	1	Green Tile	Cellulose-1% Non Fibrous-99%	Not Detected
11051-40	40	Main 1st Floor Stairs Floor	Vinyl Tile	1	Grey Tile	Cellulose-1% Non Fibrous-99%	Not Detected
11051-41	41	Main 1st Floor Hall Ceiling	Drywall Filler Compound	1	Filler Compound	Cellulose-5% Non Fibrous-95%	Not Detected
11051-42	42	Main 1st Floor Men's Washroom Ceiling	Drywall Filler Compound	1	Filler Compound	Cellulose-5% Non Fibrous-95%	Not Detected
11051-43	43	Main 1st Floor Stairs Ceiling	Drywall Filler Compound	1	Filler Compound	Cellulose-5% Non Fibrous-95%	Not Detected
11051-44	44	Main 2nd Floor Stairs Wall	Drywall Filler Compound	1	Filler Compound	Cellulose-5% Non Fibrous-95%	Not Detected
11051-45	45	Main 2nd Floor Open Office Wall	Drywall Filler Compound	1	Filler Compound	Cellulose-5% Non Fibrous-95%	Not Detected
11051-46	46	Main 2nd Floor Open Office Wall	Drywall Filler Compound	1	Filler Compound	Cellulose-5% Non Fibrous-95%	Not Detected

Analytical Method: NIOSH 9002 Analyst: Ben Wang

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CLIENT ID: Antiquity (Resort Municipality of Whistler)
SAMPLES SUBMITTED BY: Chris/Brendan
LOCATION: 8020 Nesters Road, Whistler
DATE ANALYZED: March 8/2017
BCHI ID: 11051

BULK ASBESTOS RESULTS

BCHI SAMPLE ID	CLIENT SAMPLE ID	SAMPLE LOCATION	MATERIAL TYPE	LAYER #	LAYER DESCRIPTION	OTHER MATERIAL & AMOUNT	ASBESTOS TYPE & AMOUNT
11051-47	47	Main 2nd Floor Open Office Ceiling	Drywall Filler Compound	1	Filler Compound	Cellulose-5% Non Fibrous-95%	Not Detected
11051-48	48	Main 2nd Floor Lunch Room Ceiling	Texture Coat	1	Texture Coat	Cellulose-10% Non Fibrous-90%	Not Detected
11051-49	49	Main 2nd Floor Lunch Room Wall	Drywall Filler Compound	1	Filler Compound	Cellulose-5% Non Fibrous-95%	Not Detected
11051-50	50	Main 2nd Floor Lunch Room Ceiling	Texture Coat	1	Texture Coat	Cellulose-10% Non Fibrous-90%	Not Detected
11051-51	51	Main 2nd Floor Lunch Room Closet Floor	Vinyl Sheet	1	Vinyl Top	Cellulose-2% Non Fibrous-98%	Not Detected
				2	Backing	Cellulose-50% Non Fibrous-50%	Not Detected
11051-52	52	Main 2nd Floor Lunch Room Floor	Vinyl Sheet	1	Vinyl Top	Non Fibrous>99%	Not Detected
				2	Backing	Cellulose-2% Non Fibrous-98%	Not Detected

Analytical Method: NIOSH 9002 Analyst: Ben Wang

Coast BC Hazmat Inspections Inc. participates in the AIHA bulk asbestos proficiency analytical testing program, participant number 223436

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CLIENT ID: Antiquity (Resort Municipality of Whistler)
SAMPLES SUBMITTED BY: Chris/Brendan
LOCATION: 8020 Nesters Road, Whistler
DATE ANALYZED: March 8/2017
BCHI ID: 11051

BULK ASBESTOS RESULTS

BCHI SAMPLE ID	CLIENT SAMPLE ID	SAMPLE LOCATION	MATERIAL TYPE	LAYER #	LAYER DESCRIPTION	OTHER MATERIAL & AMOUNT	ASBESTOS TYPE & AMOUNT
11051-53	53	Main 2nd Floor Lunch Room Floor	Vinyl Sheet	1	Vinyl Top	Cellulose-2% Non Fibrous-98%	Not Detected
				2	Backing	Cellulose-50% Non Fibrous-50%	Not Detected
11051-54	54	Main 2nd Floor Fire Rescue Floor	Vinyl Sheet	1	Vinyl Top	Cellulose-2% Non Fibrous-98%	Not Detected
				2	Backing	Synthetic-90% Non Fibrous-10%	Not Detected
11051-55	55	Main 2nd Floor Open Office Hall Closet, Floor	Mastic	1	Mastic	Cellulose-2% Non Fibrous-98%	Not Detected
11051-56	56	Main 2nd Floor Open Office Floor	Mastic	1	Mastic	Cellulose-2% Non Fibrous-98%	Not Detected
11051-57	57	Main 2nd Floor Meeting Room Floor	Mastic	1	Mastic	Cellulose-2% Non Fibrous-98%	Not Detected
11051-58	58	Main 2nd Floor Stairs Floor	Vinyl Tile	1	Black Tile	Cellulose-1% Non Fibrous-99%	Not Detected

Analytical Method: NIOSH 9002 Analyst: Ben Wang

Coast BC Hazmat Inspections Inc. participates in the AIHA bulk asbestos proficiency analytical testing program, participant number 223436

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CLIENT ID: Antiquity (Resort Municipality of Whistler)
SAMPLES SUBMITTED BY: Chris/Brendan
LOCATION: 8020 Nesters Road, Whistler
DATE ANALYZED: March 8/2017
BCHI ID: 11051

BULK ASBESTOS RESULTS

BCHI SAMPLE ID	CLIENT SAMPLE ID	SAMPLE LOCATION	MATERIAL TYPE	LAYER #	LAYER DESCRIPTION	OTHER MATERIAL & AMOUNT	ASBESTOS TYPE & AMOUNT
11051-59	59	Main 2nd Floor Open Office Ceiling	Texture Coat	1	Texture Coat	Cellulose-10% Non Fibrous-90%	Not Detected
11051-60	60	Main 2nd Floor Training Room Washroom, Floor	Vinyl Tile	1	Green Tile	Cellulose-1% Non Fibrous-99%	Not Detected
11051-61	61	Main 2nd Floor Training Room Washroom, Wall	Drywall Filler Compound	1	Filler Compound	Cellulose-5% Non Fibrous-95%	Not Detected
11051-62	62	Main 2nd Floor Training Room Washroom, Wall	Drywall Filler Compound	1	Filler Compound	Cellulose-5% Non Fibrous-95%	Not Detected
11051-63	63	Main 2nd Floor Training Room Washroom, Wall	Drywall Filler Compound	1	Filler Compound	Cellulose-5% Non Fibrous-95%	Not Detected
11051-64	64	Main 2nd Floor Open Office Floor	Leveling Compound & Glue	1	Leveling Compound	Cellulose-1% Non Fibrous-99%	Not Detected
				2	Glue	Non Fibrous>99%	Not Detected
11051-65	65	Main 2nd Floor Open Office Floor	Leveling Compound & Glue	1	Leveling Compound	Cellulose-1% Non Fibrous-99%	Not Detected

Analytical Method: NIOSH 9002 Analyst: Ben Wang

Coast BC Hazmat Inspections Inc. participates in the AIHA bulk asbestos proficiency analytical testing program, participant number 223436

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CLIENT ID: Antiquity (Resort Municipality of Whistler)
SAMPLES SUBMITTED BY: Chris/Brendan
LOCATION: 8020 Nesters Road, Whistler
DATE ANALYZED: March 8/2017
BCHI ID: 11051

BULK ASBESTOS RESULTS

BCHI SAMPLE ID	CLIENT SAMPLE ID	SAMPLE LOCATION	MATERIAL TYPE	LAYER #	LAYER DESCRIPTION	OTHER MATERIAL & AMOUNT	ASBESTOS TYPE & AMOUNT
				2	Glue	Non Fibrous>99%	Not Detected
11051-66	66	Main 2nd Floor Open Office Floor	Leveling Compound & Glue	1	Leveling Compound	Cellulose-1% Non Fibrous-99%	Not Detected
				2	Glue	Non Fibrous>99%	Not Detected
11051-67	67	Main 2nd Floor Training Room Washroom, Ceiling	Drywall Filler Compound	1	Filler Compound	Cellulose-5% Non Fibrous-95%	Not Detected
11051-68	68	Main 2nd Floor Training Room Washroom, Ceiling	Drywall Filler Compound	1	Filler Compound	Cellulose-5% Non Fibrous-95%	Not Detected
11051-69	69	Main 2nd Floor Training Room Washroom, Ceiling	Drywall Filler Compound	1	Filler Compound	Cellulose-5% Non Fibrous-95%	Not Detected

Analytical Method: NIOSH 9002 Analyst: Ben Wang

Coast BC Hazmat Inspections Inc. participates in the AIHA bulk asbestos proficiency analytical testing program, participant number 223436

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MARCH 9/2017

The 26 samples submitted for your project ID #11066 for site: "4325 Blackcomb way, Whistler, BC ", have been analyzed. The following page(s) contain the Bulk Asbestos Identification Results for your project.

The samples were analyzed by the NIOSH (National Institute for Occupational Safety and Health) Method 9002, using stereo binocular microscopy and polarized light microscopy. Coast BC Hazmat Inspections INC. participates in EPA (Environmental Protection Agency) Test Method for Determination of Asbestos in Bulk Building Materials. Coast BC Hazmat Inspections Inc. participates in the AIHA bulk asbestos proficiency analytical testing program, participant number 223436. All samples will be retained for three months after analysis. Results relate only to the items tested.

If you have any questions or comments, please contact us.

Respectively,

Lab. Analyst: Caitlin Paulson
cc...Coast BC Hazmat Inspections Inc.

SERVICES: Hazardous Material Inspections, Consulting, Abatement, & Air Monitoring
Laboratory Services: Asbestos Bulk Sample Analysis, Air Monitoring Analysis

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CLIENT ID: Antiquity (Resort Municipality of Whistler)
SAMPLES SUBMITTED BY: Chris/ Brendan
LOCATION: 4325 Blackcomb way, Whistler, BC
DATE ANALYZED: March 9/2017
BCHI ID: 11066

BULK ASBESTOS RESULTS

BCHI SAMPLE ID	CLIENT SAMPLE ID	SAMPLE LOCATION	MATERIAL TYPE	LAYER #	LAYER DESCRIPTION	OTHER MATERIAL & AMOUNT	ASBESTOS TYPE & AMOUNT
11066-1	1 MH	Electrical room Ceiling	Drywall filler compound	1	Filler compound	Non fibrous>99%	Not Detected
11066-2	2 MH	Electrical room Ceiling	Mastic	1	Red mastic	Non fibrous>99%	Not Detected
11066-3	3 MH	Electrical room Wall	Mastic	1	Red mastic	Non fibrous>99%	Not Detected
11066-4	4 MH	Electrical room Ceiling	Mastic	1	Red mastic	Non fibrous>99%	Not Detected
11066-5	5 MH	Building department office 3 Wall	Drywall filler compound	1	Filler compound	Non fibrous>99%	Not Detected
11066-6	6 MH	Building department office 2 Wall	Drywall filler compound	1	Filler compound	Non fibrous>99%	Not Detected
11066-7	7 MH	Building department main office Wall	Drywall filler compound	1	Filler compound	Non fibrous>99%	Not Detected
11066-8	8 MH	Kitchen Wall	Drywall filler compound	1	Filler compound	Non fibrous>99%	Not Detected

Analytical Method: NIOSH 9002 Analyst: Caitlin Paulson

Coast BC Hazmat Inspections Inc. participates in the AIHA bulk asbestos proficiency analytical testing program, participant number 223436

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CLIENT ID: Antiquity (Resort Municipality of Whistler)
SAMPLES SUBMITTED BY: Chris/ Brendan
LOCATION: 4325 Blackcomb way, Whistler, BC
DATE ANALYZED: March 9/2017
BCHI ID: 11066

BULK ASBESTOS RESULTS

BCHI SAMPLE ID	CLIENT SAMPLE ID	SAMPLE LOCATION	MATERIAL TYPE	LAYER #	LAYER DESCRIPTION	OTHER MATERIAL & AMOUNT	ASBESTOS TYPE & AMOUNT
11066-9	9 MH	Kitchen Ceiling	Acoustic tile	1	Fibrous tile	Cellulose 40% Non fibrous 60%	Not Detected
11066-10	10 MH	Kitchen Ceiling	Drywall filler compound	1	Filler compound	Non fibrous>99%	Not Detected
11066-11	11 MH	Hall by men's room Wall	Drywall filler compound	1	Filler compound	Non fibrous>99%	Not Detected
11066-12	12 MH	Engineering dept. open office Ceiling	Acoustic tile	1	Fibrous tile	Cellulose 40% Non fibrous 60%	Not Detected
11066-13	13 MH	Engineering dept. open office Ceiling	Drywall filler compound	1	Filler compound	Non fibrous>99%	Not Detected
11066-14	14 MH	Engineering dept. hall Wall	Drywall filler compound	1	Filler compound	Non fibrous>99%	Not Detected
11066-15	15 MH	Engineering dept. reception Wall	Drywall filler compound	1	Filler compound	Non fibrous>99%	Not Detected
11066-16	16 MH	Planning dept. hall Wall	Drywall filler compound	1	Filler compound	Non fibrous>99%	Not Detected

Analytical Method: NIOSH 9002 Analyst: Caitlin Paulson

Coast BC Hazmat Inspections Inc. participates in the AIHA bulk asbestos proficiency analytical testing program, participant number 223436

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SURREY, BC V3W 8J9

CLIENT ID: Antiquity (Resort Municipality of Whistler)
SAMPLES SUBMITTED BY: Chris/ Brendan
LOCATION: 4325 Blackcomb way, Whistler, BC
DATE ANALYZED: March 9/2017
BCHI ID: 11066

BULK ASBESTOS RESULTS

BCHI SAMPLE ID	CLIENT SAMPLE ID	SAMPLE LOCATION	MATERIAL TYPE	LAYER #	LAYER DESCRIPTION	OTHER MATERIAL & AMOUNT	ASBESTOS TYPE & AMOUNT
11066-17	17 MH	Planning dept. "files" Floor	Vinyl tile	1	White tile	Cellulose 2% Non fibrous 98%	Not Detected
11066-18	18 MH	Planning dept. exit Floor	Mastic	1	Yellow mastic	Cellulose 5% Non fibrous 95%	Not Detected
11066-19	19 MH	Planning dept. hall Ceiling	Acoustic tile	1	Fibrous tile	Cellulose 40% Non fibrous 60%	Not Detected
11066-20	20 MH	Planning dept. reception Ceiling	Drywall filler compound	1	Filler compound	Non fibrous>99%	Not Detected
11066-21	21 MH	Engineering dept. "alcove" Floor	Mastic	1	Yellow mastic	Cellulose 5% Non fibrous 95%	Not Detected
11066-22	22 MH	Engineering dept. meeting room Ceiling	Drywall filler compound	1	Filler compound	Non fibrous>99%	Not Detected
11066-23	23 MH	Engineering dept. meeting room Ceiling duct	Mastic	1	White mastic	Synthetic 5% Non fibrous 95%	Not Detected
11066-24	24 MH	Engineering dept. meeting room Ceiling duct	Mastic	1	White mastic	Synthetic 5% Non fibrous 95%	Not Detected

Analytical Method: NIOSH 9002 Analyst: Caitlin Paulson

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CLIENT ID: Antiquity (Resort Municipality of Whistler)
SAMPLES SUBMITTED BY: Chris/ Brendan
LOCATION: 4325 Blackcomb way, Whistler, BC
DATE ANALYZED: March 9/2017
BCHI ID: 11066

BULK ASBESTOS RESULTS

BCHI SAMPLE ID	CLIENT SAMPLE ID	SAMPLE LOCATION	MATERIAL TYPE	LAYER #	LAYER DESCRIPTION	OTHER MATERIAL & AMOUNT	ASBESTOS TYPE & AMOUNT
11066-25	25 MH	Engineering dept. meeting room Ceiling duct	Mastic	1	White mastic	Synthetic 5% Non fibrous 95%	Not Detected
11066-26	26 MH	Building dept. main office Floor	Mastic	1	Yellow mastic	Cellulose 5% Non fibrous 95%	Not Detected

Analytical Method: NIOSH 9002 Analyst: Caitlin Paulson

Coast BC Hazmat Inspections Inc. participates in the AIHA bulk asbestos proficiency analytical testing program, participant number 223436

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MARCH 9/2017

The 14 samples submitted for your project ID #11065-2 for site: "8020 Nester's Rd, Whistler, BC ", have been analyzed. The following page(s) contain the Bulk Asbestos Identification Results for your project.

The samples were analyzed by the NIOSH (National Institute for Occupational Safety and Health) Method 9002, using stereo binocular microscopy and polarized light microscopy. Coast BC Hazmat Inspections INC. participates in EPA (Environmental Protection Agency) Test Method for Determination of Asbestos in Bulk Building Materials. Coast BC Hazmat Inspections Inc. participates in the AIHA bulk asbestos proficiency analytical testing program, participant number 223436. All samples will be retained for three months after analysis. Results relate only to the items tested.

If you have any questions or comments, please contact us.

Respectively,

Lab. Analyst: Caitlin Paulson
cc...Coast BC Hazmat Inspections Inc.

SERVICES: Hazardous Material Inspections, Consulting, Abatement, & Air Monitoring
Laboratory Services: Asbestos Bulk Sample Analysis, Air Monitoring Analysis

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CLIENT ID: Resort Municipality of Whistler
SAMPLES SUBMITTED BY: Chris/ Brendan
LOCATION: 8020 Nester's Rd, Whistler, BC
DATE ANALYZED: March 9/2017
BCHI ID: 11065-2

BULK ASBESTOS RESULTS

BCHI SAMPLE ID	CLIENT SAMPLE ID	SAMPLE LOCATION	MATERIAL TYPE	LAYER #	LAYER DESCRIPTION	OTHER MATERIAL & AMOUNT	ASBESTOS TYPE & AMOUNT
11065-2-1	1 RB	Roads 1st Floor Stairwell Floor	Vinyl tile	1	White tile	Cellulose 1% Non fibrous 99%	Not Detected
11065-2-2	2 RB	Roads 1st Floor Bathroom Floor	Vinyl tile	1	Dark grey tile	Non fibrous>99%	Not Detected
				2	Backing	Synthetic 10% Non fibrous 90%	Not Detected
11065-2-3	3 RB	Roads 1st Floor Sign Shop Wall	Drywall Filler Compound	1	Filler Compound	Non fibrous>99%	Not Detected
11065-2-4	4 RB	Roads 1st Floor Storage Closet Ceiling	Drywall Filler Compound	1	Paper (No filler compound)	Cellulose 90% Non fibrous 10%	Not Detected
11065-2-5	5 RB	Roads 1st Floor Electrical Room Wall	Drywall Filler Compound	1	Filler Compound	Non fibrous>99%	Not Detected
11065-2-6	6 RB	Roads 1st Floor Storage Wall	Drywall Filler Compound	1	Filler Compound	Non fibrous>99%	Not Detected
11065-2-7	7 RB	Roads 1st Floor Electrical Room Ceiling	Drywall Filler Compound	1	Filler Compound	Non fibrous>99%	Not Detected

Analytical Method: NIOSH 9002 Analyst: Caitlin Paulson

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CLIENT ID: Resort Municipality of Whistler
SAMPLES SUBMITTED BY: Chris/ Brendan
LOCATION: 8020 Nester's Rd, Whistler, BC
DATE ANALYZED: March 9/2017
BCHI ID: 11065-2

BULK ASBESTOS RESULTS

BCHI SAMPLE ID	CLIENT SAMPLE ID	SAMPLE LOCATION	MATERIAL TYPE	LAYER #	LAYER DESCRIPTION	OTHER MATERIAL & AMOUNT	ASBESTOS TYPE & AMOUNT
11065-2-8	8 RB	Roads 1st Floor Electrical Room Ceiling	Drywall Filler Compound	1	Filler Compound	Non fibrous>99%	Not Detected
11065-2-9	9 RB	Roads 2nd Floor Office Wall	Drywall Filler Compound	1	Filler Compound	Non fibrous>99%	Not Detected
11065-2-10	10 RB	Roads 2nd Floor Lunch Room Wall	Drywall Filler Compound	1	Filler Compound	Non fibrous>99%	Not Detected
11065-2-11	11 RB	Roads 2nd Floor Bathroom Wall	Drywall Filler Compound	1	Filler Compound	Non fibrous>99%	Not Detected
11065-2-12	12 RB	Roads 2nd Floor Coast Room Ceiling	Drywall Filler Compound	1	Filler Compound	Non fibrous>99%	Not Detected
11065-2-13	13 RB	Roads 2nd Floor Bathroom Ceiling	Drywall Filler Compound	1	Filler Compound	Non fibrous>99%	Not Detected
11065-2-14	14 RB	Roads 2nd Floor Lunch Room Ceiling	Drywall Filler Compound	1	Filler Compound	Non fibrous>99%	Not Detected

Analytical Method: NIOSH 9002 Analyst: Caitlin Paulson

Coast BC Hazmat Inspections Inc. participates in the AIHA bulk asbestos proficiency analytical testing program, participant number 223436

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MARCH 9/2017

The 27 samples submitted for your project ID #11065 for site: "8020 Nester's Rd, Whistler, BC ", have been analyzed. The following page(s) contain the Bulk Asbestos Identification Results for your project.

The samples were analyzed by the NIOSH (National Institute for Occupational Safety and Health) Method 9002, using stereo binocular microscopy and polarized light microscopy. Coast BC Hazmat Inspections INC. participates in EPA (Environmental Protection Agency) Test Method for Determination of Asbestos in Bulk Building Materials. Coast BC Hazmat Inspections Inc. participates in the AIHA bulk asbestos proficiency analytical testing program, participant number 223436. All samples will be retained for three months after analysis. Results relate only to the items tested.

If you have any questions or comments, please contact us.

Respectively,

Lab. Analyst: Caitlin Paulson
cc...Coast BC Hazmat Inspections Inc.

SERVICES: Hazardous Material Inspections, Consulting, Abatement, & Air Monitoring
Laboratory Services: Asbestos Bulk Sample Analysis, Air Monitoring Analysis

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CLIENT ID: Resort Municipality of Whistler
SAMPLES SUBMITTED BY: Chris/ Brendan
LOCATION: 8020 Nester's Rd, Whistler, BC
DATE ANALYZED: March 9/2017
BCHI ID: 11065

BULK ASBESTOS RESULTS

BCHI SAMPLE ID	CLIENT SAMPLE ID	SAMPLE LOCATION	MATERIAL TYPE	LAYER #	LAYER DESCRIPTION	OTHER MATERIAL & AMOUNT	ASBESTOS TYPE & AMOUNT
11065-1	1 UB	Utilities 1st Floor Work Bay Ceiling	Drywall Filler Compound	1	Filler compound	Non fibrous>99%	Not Detected
11065-2	2 UB	Utilities 1st Floor Work Bay Wall	Drywall Filler Compound	1	Filler compound	Non fibrous>99%	Not Detected
11065-3	3 UB	Utilities 1st Floor Work Bay Wall	Drywall Filler Compound	1	Filler compound	Non fibrous>99%	Not Detected
11065-4	4 UB	Utilities 1st Floor Tool Locker Ceiling	Drywall Filler Compound	1	Filler compound	Non fibrous>99%	Not Detected
11065-5	5 UB	Utilities 1st Floor Storage Bay Wall	Drywall Filler Compound	1	Filler compound	Non fibrous>99%	Not Detected
11065-6	6 UB	Utilities 1st Floor Tool Locker Ceiling duct	Mastic	1	Grey mastic	Non fibrous>99%	Not Detected
11065-7	7 UB	Utilities 1st Floor Tool Locker Ceiling duct	Mastic	1	Grey mastic	Non fibrous>99%	Not Detected
11065-8	8 UB	Utilities 1st Floor Tool Locker Ceiling duct	Mastic	1	Grey mastic	Non fibrous>99%	Not Detected

Analytical Method: NIOSH 9002 Analyst: Caitlin Paulson

Coast BC Hazmat Inspections Inc. participates in the AIHA bulk asbestos proficiency analytical testing program, participant number 223436

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CLIENT ID: Resort Municipality of Whistler
SAMPLES SUBMITTED BY: Chris/ Brendan
LOCATION: 8020 Nester's Rd, Whistler, BC
DATE ANALYZED: March 9/2017
BCHI ID: 11065

BULK ASBESTOS RESULTS

BCHI SAMPLE ID	CLIENT SAMPLE ID	SAMPLE LOCATION	MATERIAL TYPE	LAYER #	LAYER DESCRIPTION	OTHER MATERIAL & AMOUNT	ASBESTOS TYPE & AMOUNT
11065-9	9 UB	Utilities 1st Floor Work Bay Ceiling	Drywall Filler Compound	1	Filler compound	Non fibrous>99%	Not Detected
11065-10	10 UB	Utilities 2nd Floor Work Bay Mez Wall	Drywall Filler Compound	1	Filler compound	Non fibrous>99%	Not Detected
11065-11	11 UB	Utilities 2nd Floor Main Office Wall	Drywall Filler Compound	1	Filler compound	Non fibrous>99%	Not Detected
11065-12	12 UB	Utilities 2nd Floor Bathroom Wall	Drywall Filler Compound	1	Filler compound	Non fibrous>99%	Not Detected
11065-13	13 UB	Utilities 1st Floor Archives Wall	Drywall Filler Compound	1	Filler compound	Non fibrous>99%	Not Detected
11065-14	14 UB	Utilities 1st Floor Archives Wall	Drywall Filler Compound	1	Filler compound	Synthetic 3% Non fibrous 97%	Not Detected
11065-15	15 UB	Utilities 1st Floor Archives Ceiling duct	Drywall Filler Compound	1	Filler compound	Synthetic 3% Non fibrous 97%	Not Detected
11065-16	16 UB	Utilities 2nd Floor Archives Wall	Drywall Filler Compound	1	Filler compound	Non fibrous>99%	Not Detected

Analytical Method: NIOSH 9002 Analyst: Caitlin Paulson

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CLIENT ID: Resort Municipality of Whistler
SAMPLES SUBMITTED BY: Chris/ Brendan
LOCATION: 8020 Nester's Rd, Whistler, BC
DATE ANALYZED: March 9/2017
BCHI ID: 11065

BULK ASBESTOS RESULTS

BCHI SAMPLE ID	CLIENT SAMPLE ID	SAMPLE LOCATION	MATERIAL TYPE	LAYER #	LAYER DESCRIPTION	OTHER MATERIAL & AMOUNT	ASBESTOS TYPE & AMOUNT
11065-17	17 UB	Utilities 2nd Floor Archives Wall	Drywall Filler Compound	1	Filler compound	Non fibrous>99%	Not Detected
11065-18	18 UB	Utilities 2nd Floor Archives Wall	Drywall Filler Compound	1	Filler compound	Non fibrous>99%	Not Detected
11065-19	19 UB	Utilities 2nd Floor Main Office Floor	Vinyl tile	1	Green tile	Cellulose 2% Non fibrous 98%	Not Detected
				2	Backing	Cellulose 30% Non fibrous 70%	Not Detected
11065-20	20 UB	Utilities 2nd Floor Office 1 Floor	Vinyl tile	1	White tile	Non fibrous>99%	Not Detected
				2	Backing	Cellulose 10% Non fibrous 90%	Not Detected
11065-21	21 UB	Utilities 2nd Floor Work Bay Mez Floor	Vinyl tile	1	Grey tile	Non fibrous>99%	Not Detected
11065-22	22 UB	Utilities 2nd Floor Server Room Ceiling	Acoustic tile	1	Fibrous tile	Synthetic 20% Cellulose 40% Non fibrous 40%	Not Detected

Analytical Method: NIOSH 9002 Analyst: Caitlin Paulson

Coast BC Hazmat Inspections Inc. participates in the AIHA bulk asbestos proficiency analytical testing program, participant number 223436

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CLIENT ID: Resort Municipality of Whistler
SAMPLES SUBMITTED BY: Chris/ Brendan
LOCATION: 8020 Nester's Rd, Whistler, BC
DATE ANALYZED: March 9/2017
BCHI ID: 11065

BULK ASBESTOS RESULTS

BCHI SAMPLE ID	CLIENT SAMPLE ID	SAMPLE LOCATION	MATERIAL TYPE	LAYER #	LAYER DESCRIPTION	OTHER MATERIAL & AMOUNT	ASBESTOS TYPE & AMOUNT
11065-23	23 UB	Utilities 2nd Floor Main Office Ceiling	Acoustic tile	1	Fibrous tile	Synthetic 20% Cellulose 40% Non fibrous 40%	Not Detected
11065-24	24 UB	Utilities 2nd Floor Main Office Ceiling	Acoustic tile	1	Fibrous tile	Synthetic 20% Cellulose 40% Non fibrous 40%	Not Detected
11065-25	25 UB	Utilities 2nd Floor bathroom Ceiling	Drywall Filler Compound	1	Filler compound	Non fibrous>99%	Not Detected
11065-26	26 UB	Utilities 2nd Floor bathroom Ceiling	Drywall Filler Compound	1	Filler compound	Non fibrous>99%	Not Detected
11065-27	27 UB	Utilities 2nd Floor bathroom Ceiling	Drywall Filler Compound	1	Filler compound	Non fibrous>99%	Not Detected

Analytical Method: NIOSH 9002 Analyst: Caitlin Paulson

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MARCH 8, 2017

The 9 samples submitted for your project ID #11065-1 for site: "8020 Nesters Rd, Whistler, BC", have been analyzed. The following page(s) contain the lead concentration results for your project.

The samples were analyzed using the Bruker S1 Titan 500 X-Ray Fluorescence (XRF) Analyzer. Lead content is measured and displayed as PPM. Coast BC Hazmat Inspections INC. retains all samples for three months after analysis. Results relate only to the items tested.

If you have any questions or comments, please contact us.

Respectively,

Lab. Analyst: Michael Paulson
cc...Coast BC Hazmat Inspections Inc.

SERVICES: Hazardous Material Inspections, Consulting, & Air Monitoring
Laboratory Services: Asbestos Bulk Sample Analysis, Air Monitoring Analysis, Lead Paint Analysis

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CLIENT ID: Resort Municipality of Whistler
SAMPLES SUBMITTED BY: Chris/ Brendan
LOCATION: 8020 Nesters Rd, Whistler, BC
DATE ANALYZED: February 8/2017
BCHI ID: 11065-1

XRF LEAD RESULTS

BCHI SAMPLE ID	CLIENT SAMPLE ID	SAMPLE LOCATION	MATERIAL TYPE	COLOR	LEAD CONCENTRATION (PPM)	+/-
11065-1-1	MW-PB1	Main works building hall Wall	Paint Chip	White	40	12
11065-1-2	MW- PB2	Main works building Stairwell	Paint Chip	Brown	490	25
11065-1-3	UB-PB1	Utilities work bay Wall	Paint Chip	White	43	13
11065-1-4	UB-PB2	Utilities work exterior Steel support beam	Paint Chip	Grey	468	24
11065-1-5	FH-PB1	Fire hall main hall Wall	Paint Chip	White	49	12
11065-1-6	FH-PB2	Fire hall exterior Wall	Paint Chip	Red	167	19
11065-1-7	RB-PB1	Roads exterior truck bay Steel support beam	Paint Chip	Red	57	10
11065-1-8	RB-PB2	Roads sign shop Wall	Paint Chip	White	35	12

Equipment Used: Bruker Titan 500 XRF Analyzer Analyst: Michael Paulson

WorksafeBC considers samples ≥ 90 PPM to be Lead Containing

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CLIENT ID: Resort Municipality of Whistler
SAMPLES SUBMITTED BY: Chris/ Brendan
LOCATION: 8020 Nesters Rd, Whistler, BC
DATE ANALYZED: February 8/2017
BCHI ID: 11065-1

XRF LEAD RESULTS

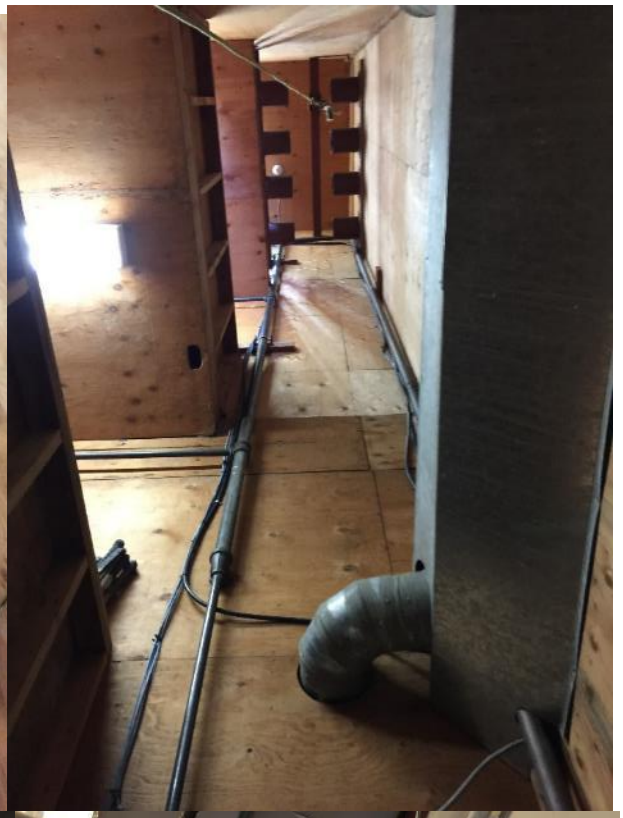
BCHI SAMPLE ID	CLIENT SAMPLE ID	SAMPLE LOCATION	MATERIAL TYPE	COLOR	LEAD CONCENTRATION (PPM)	+/-
11065-1-9	MH-PB2	Municipal hall exterior Wall	Paint Chip	Beige	3624	59

Equipment Used: Bruker Titan 500 XRF Analyzer Analyst: Michael Paulson

WorksafeBC considers samples ≥ 90 PPM to be Lead Containing

19.0 Appendix C – Site Pictures

Site Pictures for Fire Hall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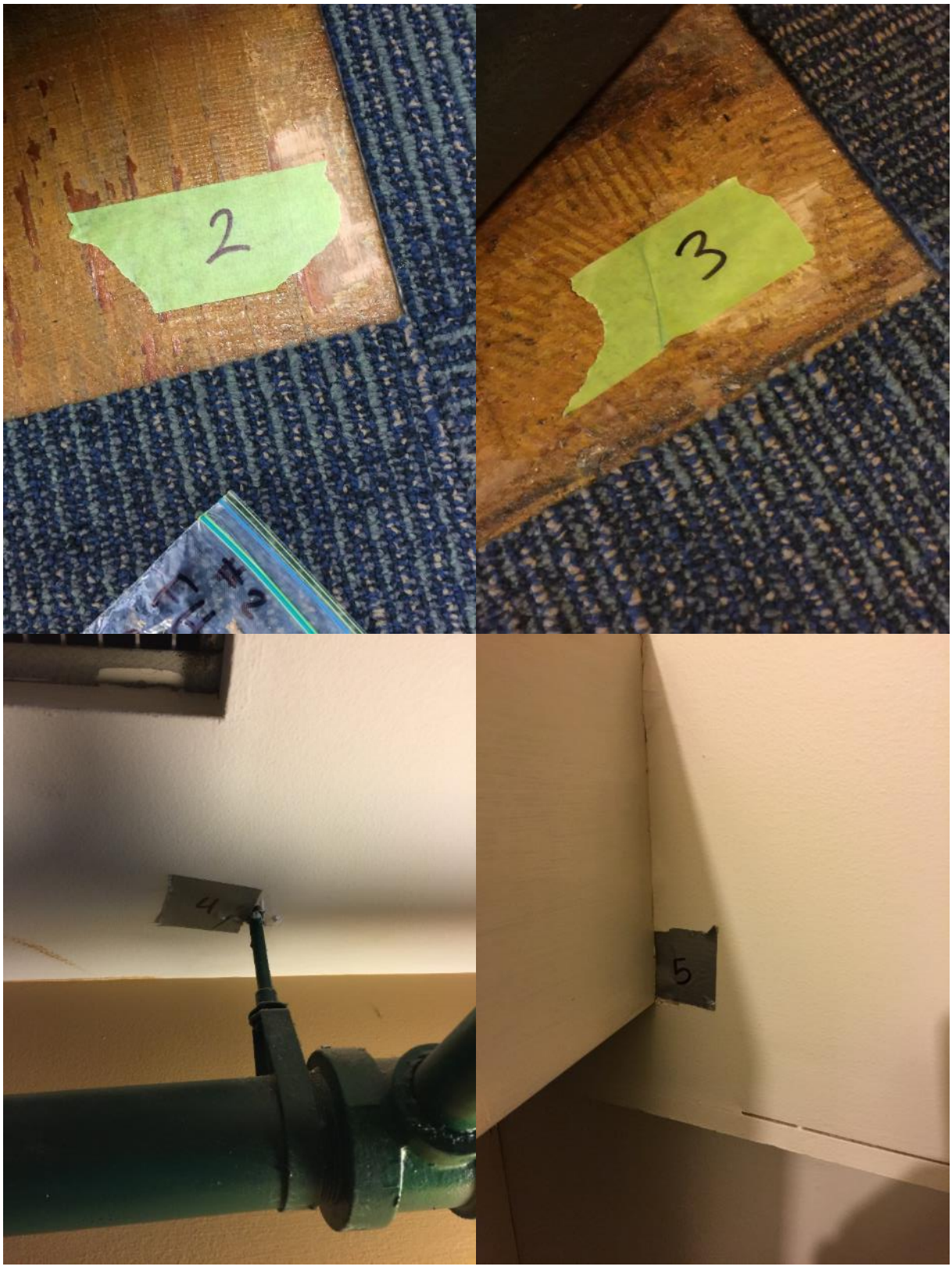
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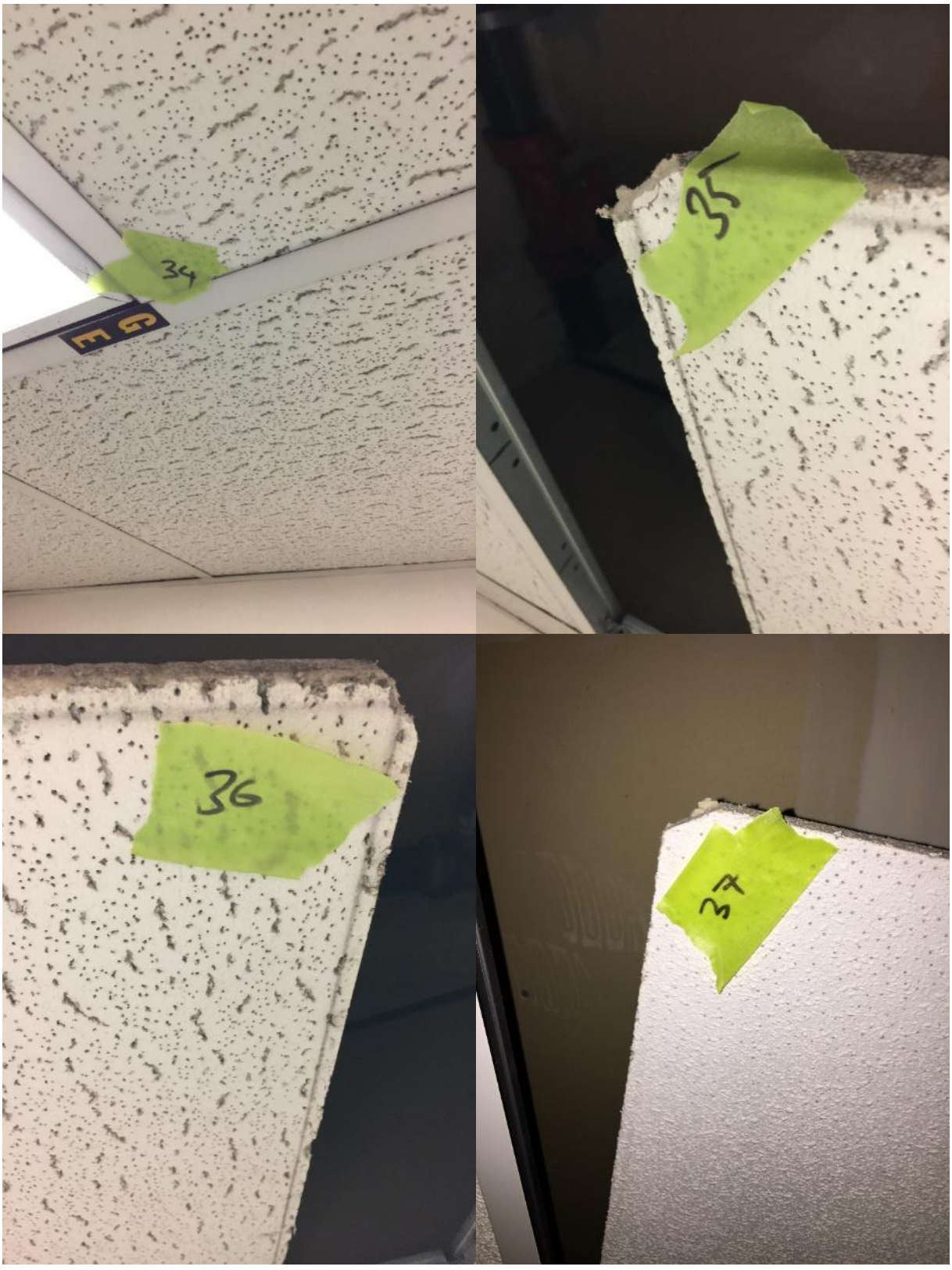
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Site Pictures for the Main Works Yard Building


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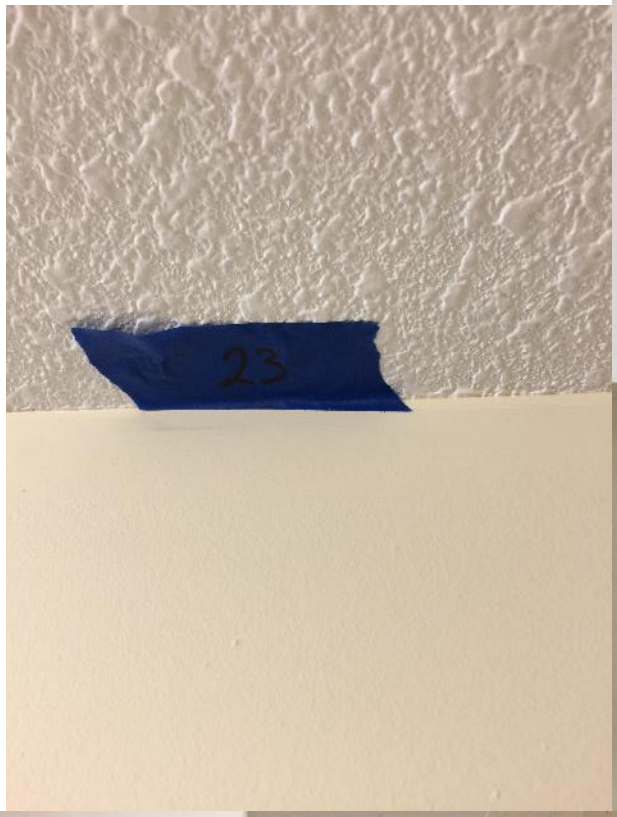
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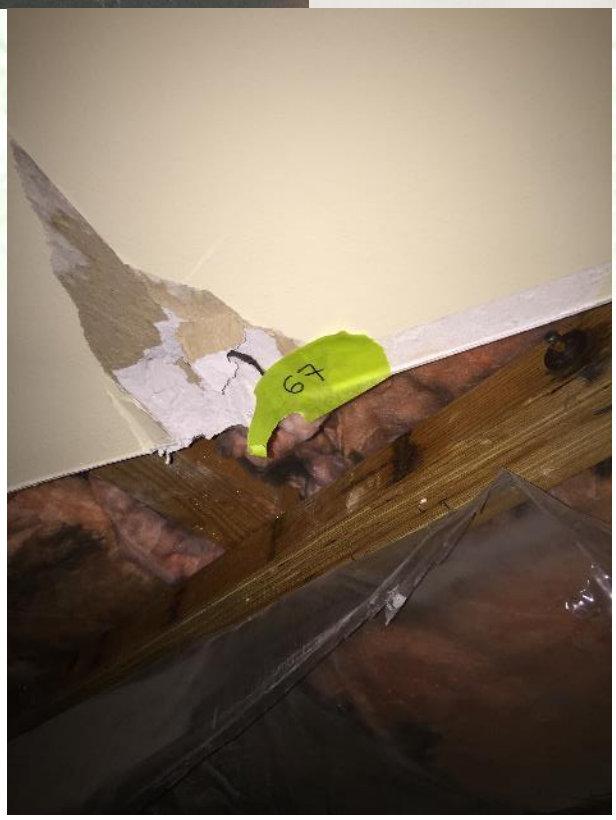
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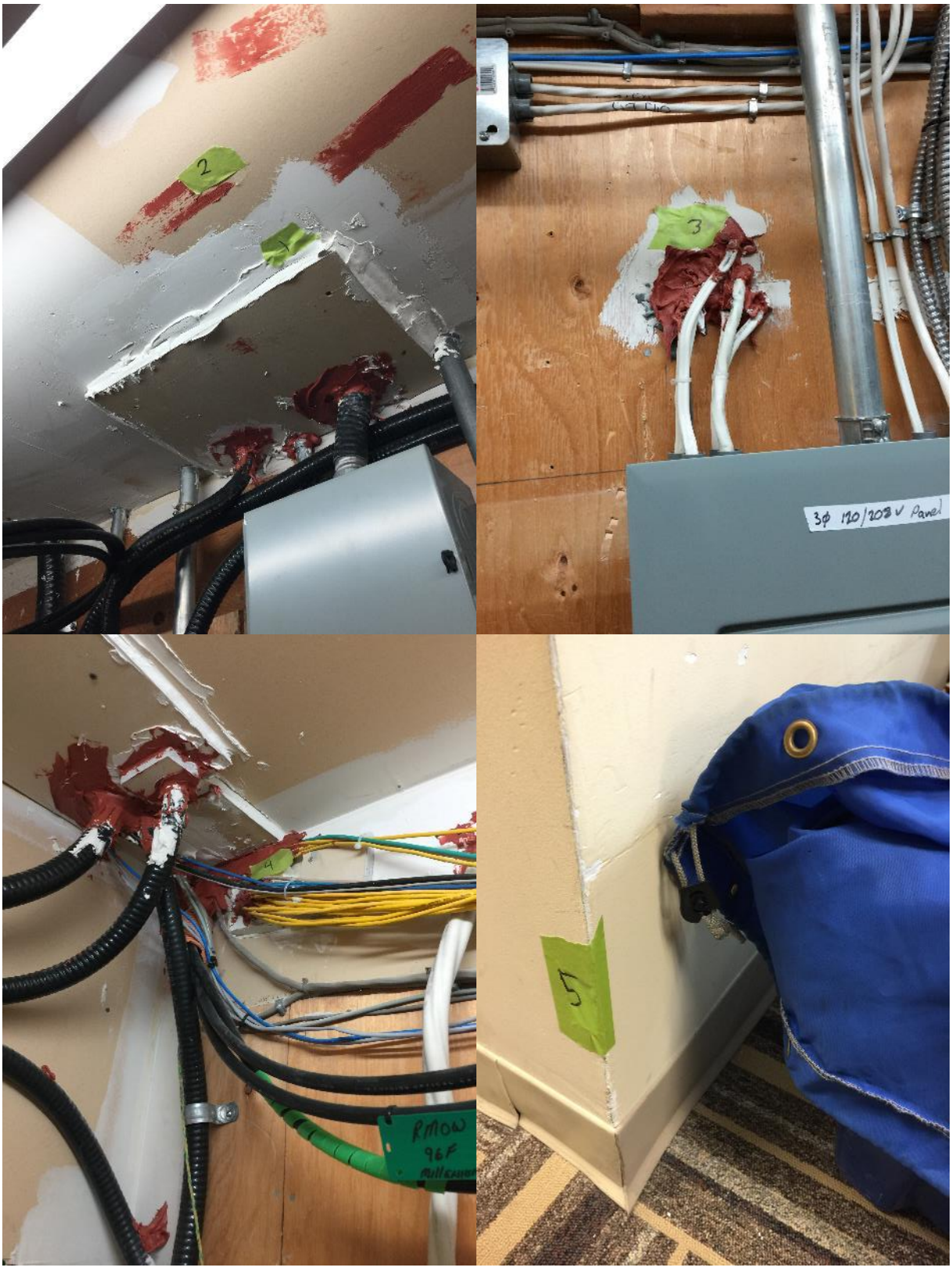
Site Pictures for Municipal Hall (1st floor)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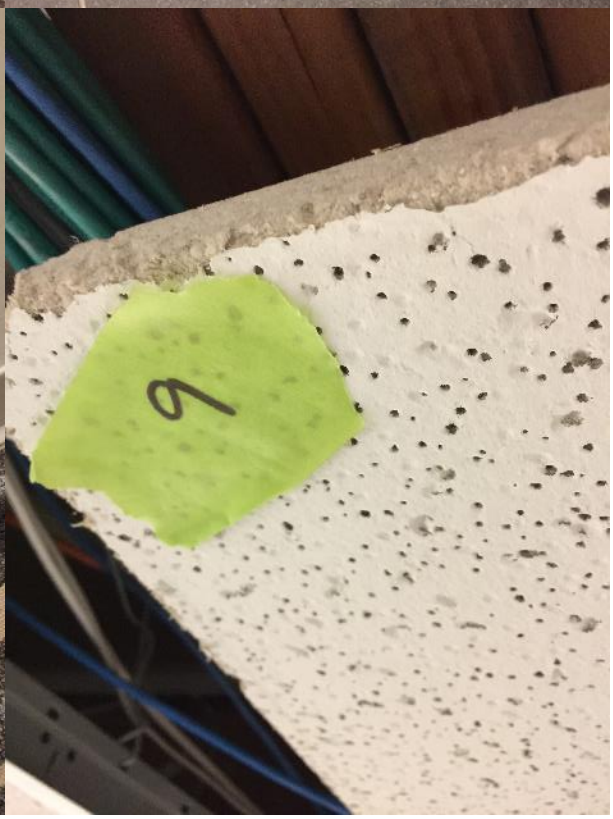
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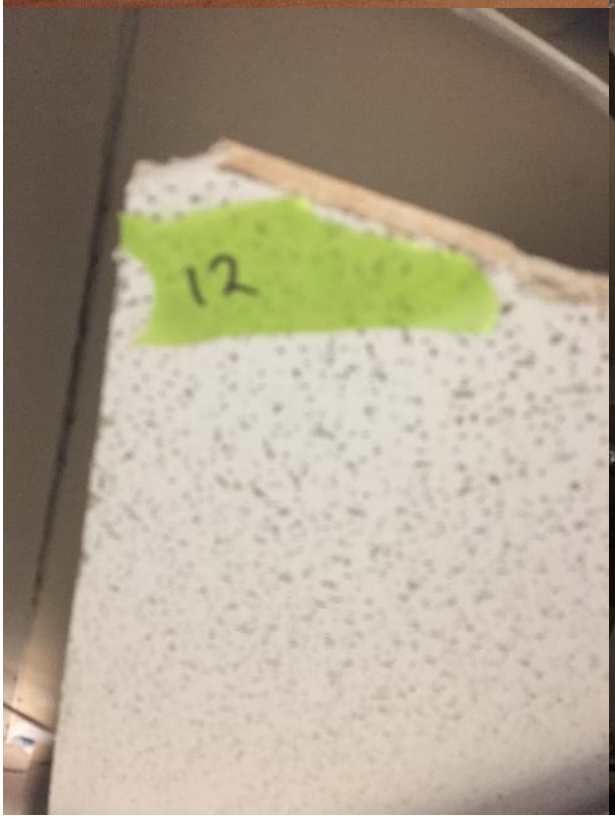
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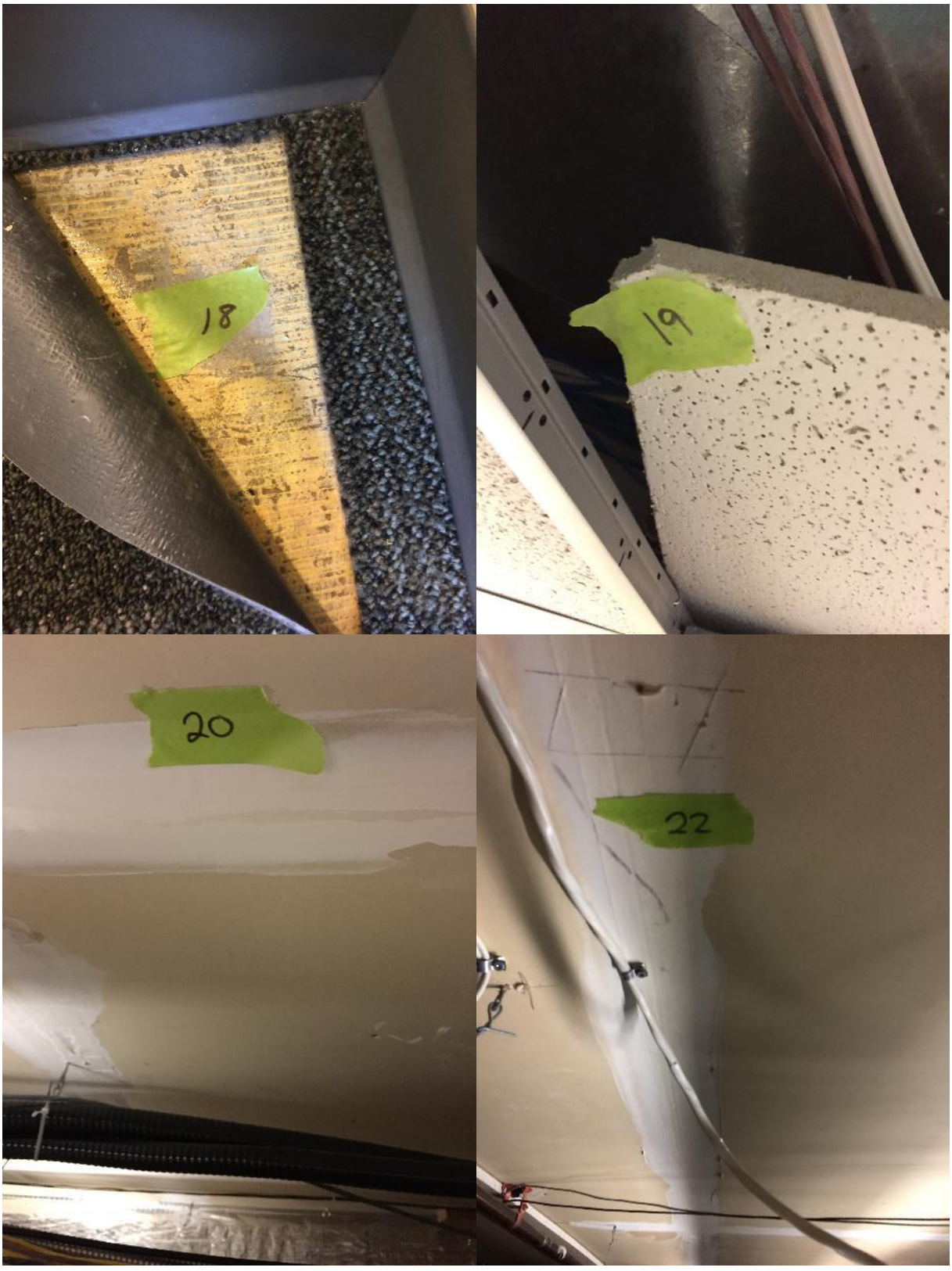
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Site Pictures for Roads Building


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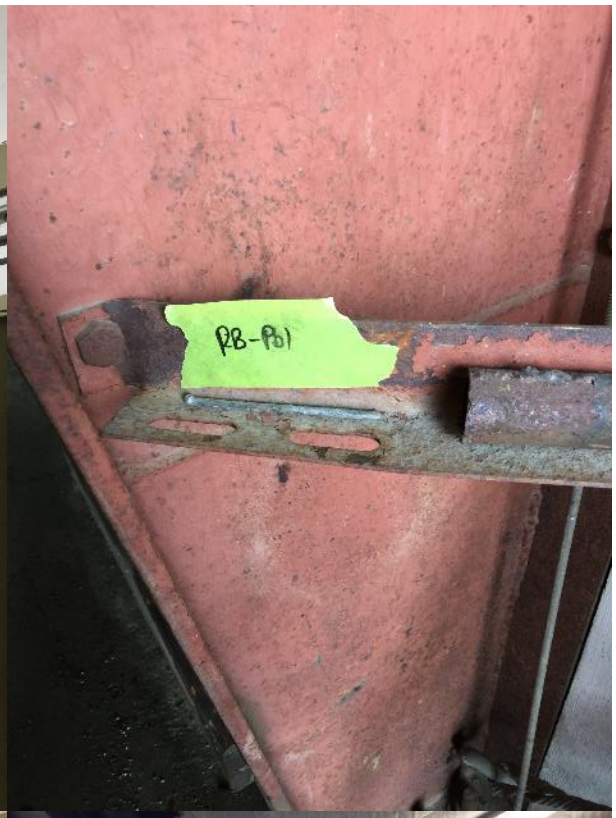
STOP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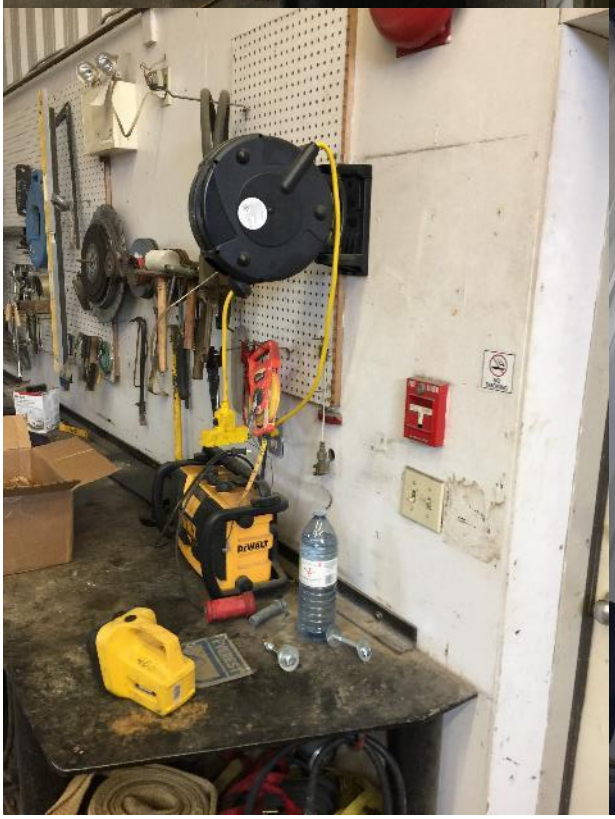
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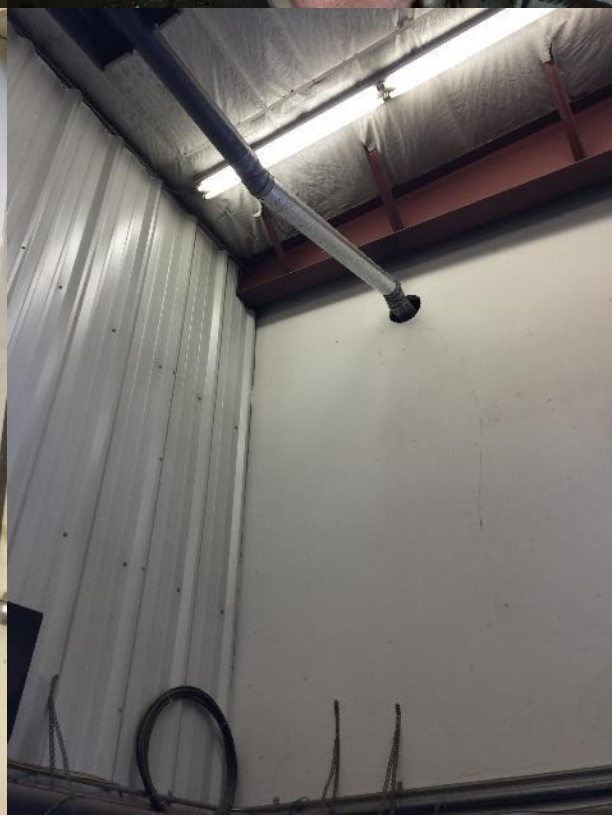


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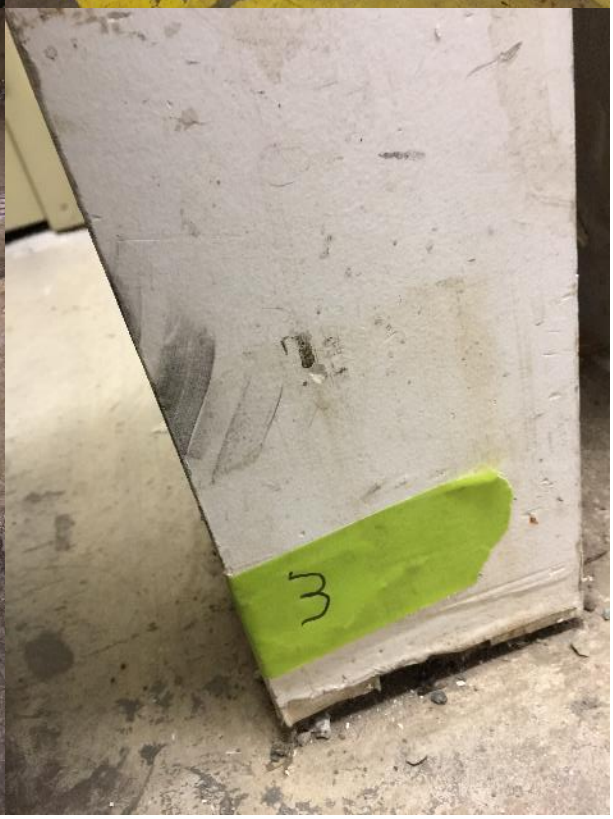
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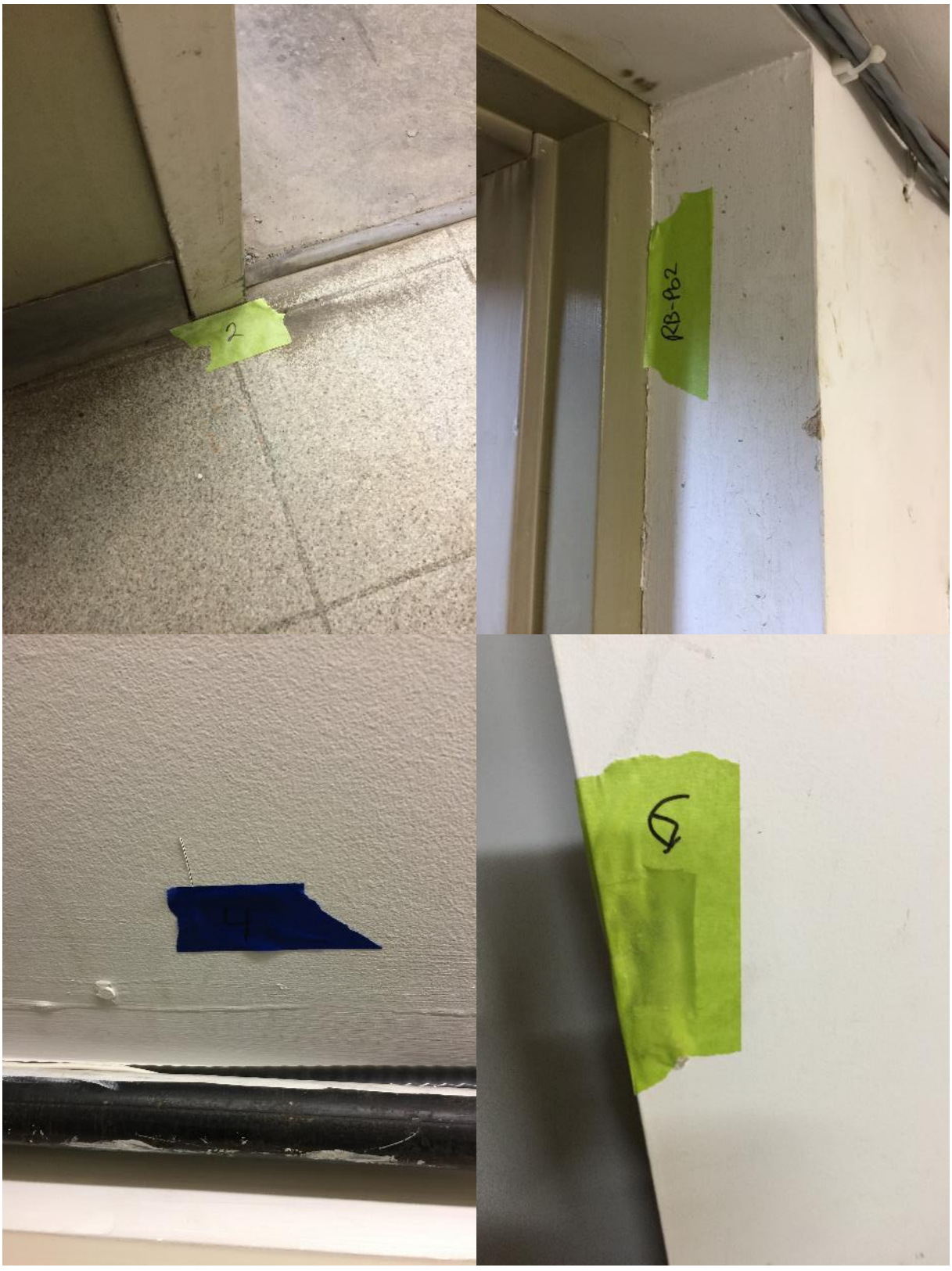
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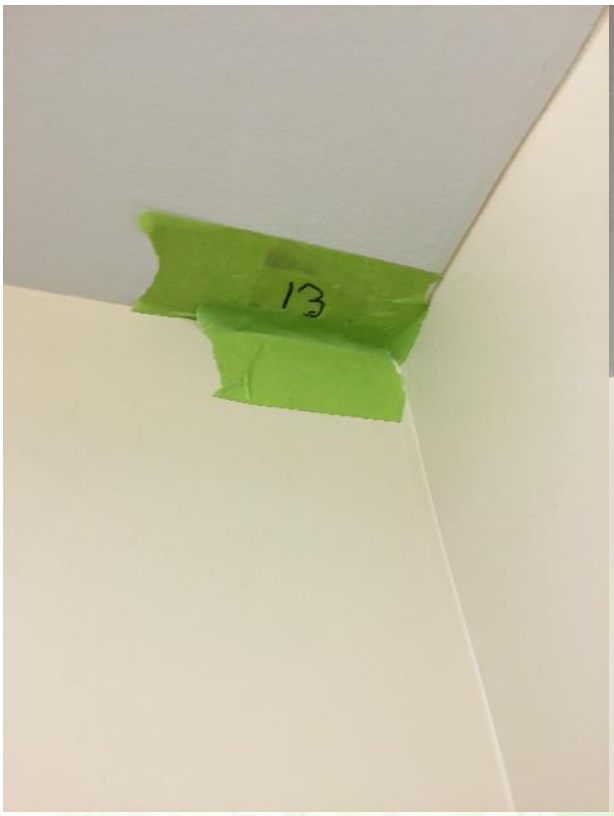
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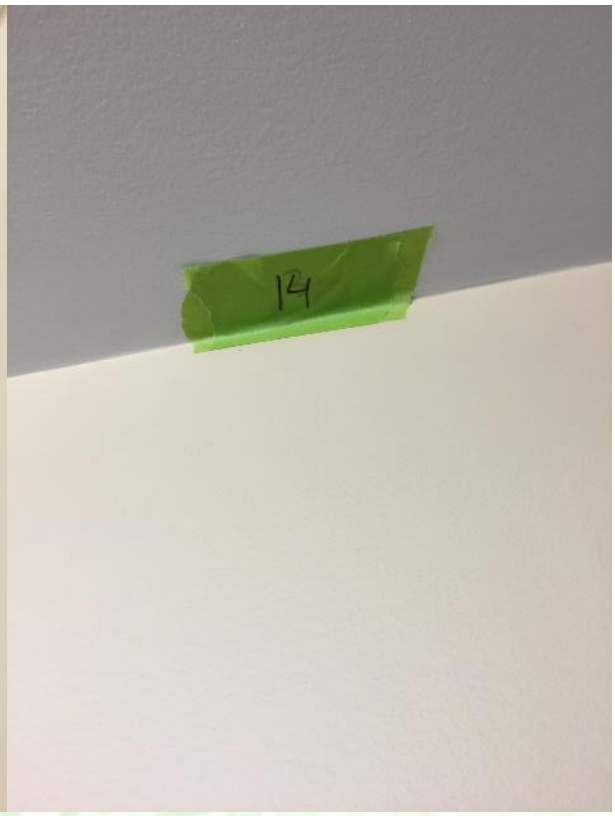
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Site Pictures for Utilities Building


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SDMO


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V404
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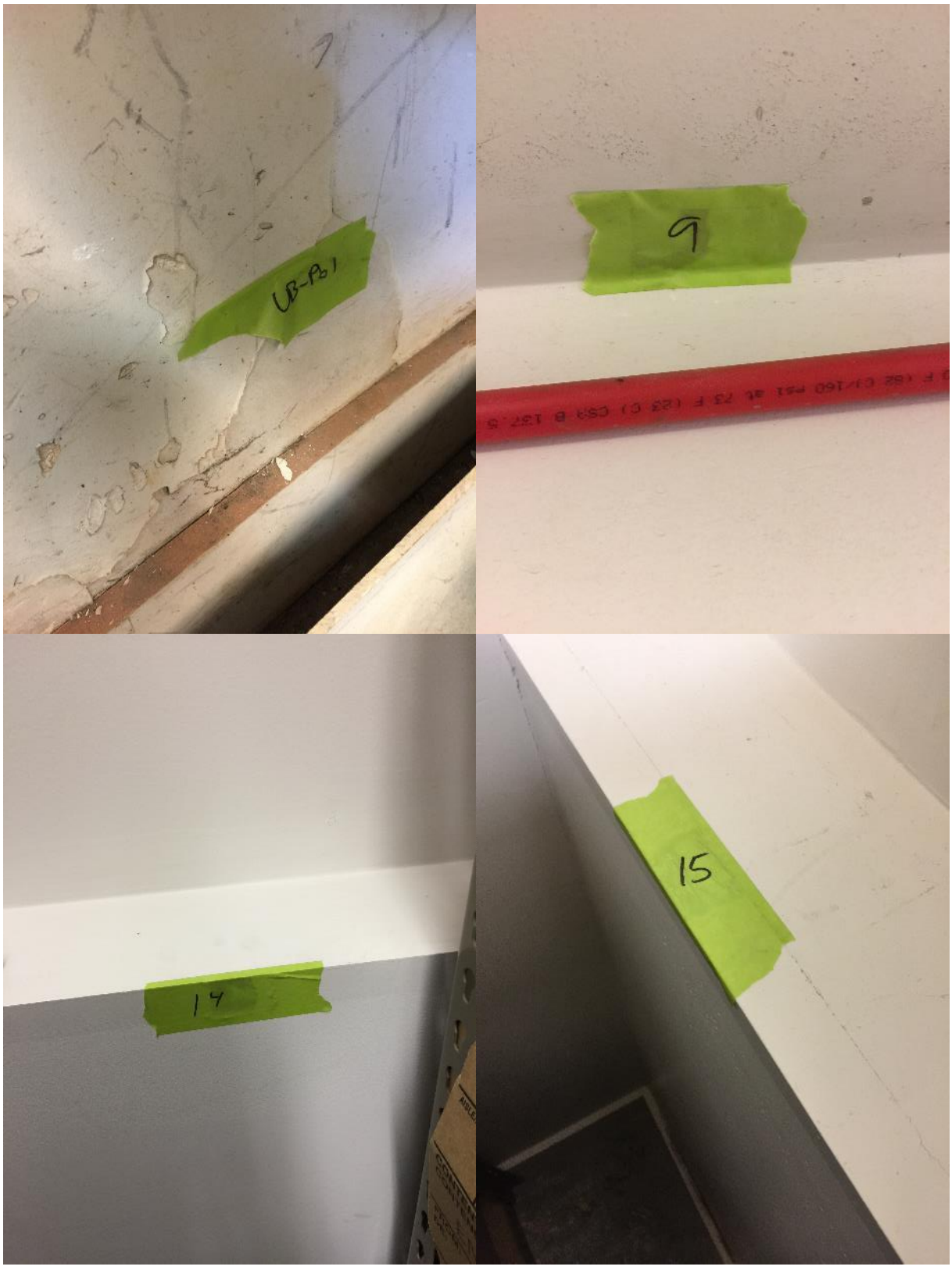
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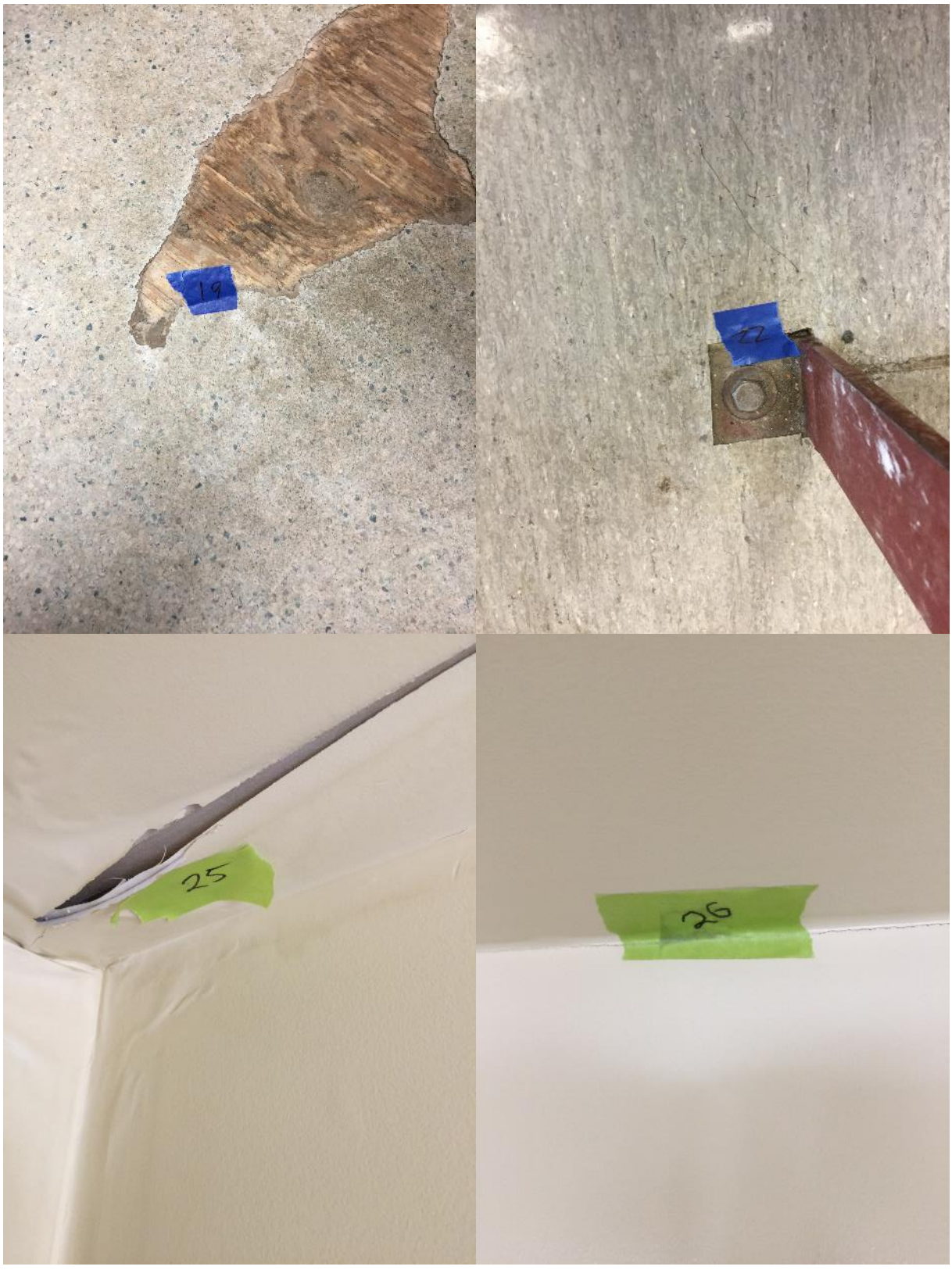
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20.0 Appendix D – Statement of Limitations

The report is intended to direct the Client's attention to recognised environmental conditions and to potential sources of environmental contamination. The findings and conclusion regarding contamination of the property are based solely on the extent of observations and information gathered during the assessment. Nothing in the report is intended to express any legal opinion upon environmental liabilities relating to the site or whether operations legally conformed to relevant legislative requirements.

Furthermore, it must be understood that changing circumstances in the physical environment, the use of the property, as well as changes in any substances stored, used, or handled at the property could alter radically the conclusions and information contained in this report. Therefore, it is important that the property is periodically re-evaluated and the client kept informed as to development, which may impact the property.

Estimations of volumes & regions of the facility with respect to room dimensions and/or extent of contamination of hazardous materials including asbestos are *approximations only*. These approximations should not be used by any party to estimate potential remediation or abatement work-loads. Instead, accurate measurements should be generated by the abatement contractor prior to work commencing at the site.

Should the abatement contractor or any other party encounter any other suspect materials not identified in this document prior to demolition of the building AECL is to be notified immediately to conduct further sampling as required of any suspect ACM materials.

BC ASBESTOS SERVICES Ltd. - 102 - 8299 - 129 St. Surrey BC V3W 0A6 Ph: 778-866-9807

Bulk Asbestos Results

Client: Antiquity Environmental Consulting - 4325 Blackcomb - Whistler - City Hall

BCAS Sample #	Client Sample #	Date Analyzed	Sample Description	Material Type	Layer #	Layer Description	Other Materials Type & Amount	Asbestos Type & Amount
85282	#1	08-Apr-13	IOffice With Beige Paint	Drywall Filler Compound	1	Filler Compound	Non-fibrous >99 %	None Detected
85283	#2	08-Apr-13	Behind Reception Desk With Beige Paint	Drywall Filler Compound	1	Filler Compound	Non-fibrous >99 %	None Detected
85284	#3	08-Apr-13	Front Entrance Wall With Beige Paint	Drywall Filler Compound	1	Filler Compound	Non-fibrous >99 %	None Detected
85285	#4	08-Apr-13	Reception Desk Front With Beige Paint	Drywall Filler Compound	1	Filler Compound	Non-fibrous >99 %	None Detected
85286	#5	08-Apr-13	Front Door Stair Going Down With Beige Paint	Drywall Filler Compound	1	Filler Compound	Non-fibrous >99 %	None Detected
85287	#6	08-Apr-13	Main Reception With Beige Paint	Drywall Filler Compound	1	Filler Compound	Non-fibrous >99 %	None Detected
85288	#7	08-Apr-13	Hallway With Beige Paint	Drywall Filler Compound	1	Filler Compound	Non-fibrous >99 %	None Detected
85289	#8	08-Apr-13	Copy Room With Beige Paint	Drywall Filler Compound	1	Filler Compound	Non-fibrous >99 %	None Detected
					2	Paper	Cellulose 90 % Non-fibrous 10 %	None Detected
					3	Drywall	Cellulose 10 % Non-fibrous 90 %	None Detected

Analytical Method: NIOSH 9002 Analyst: David Whiteside Samples submitted by: Allan

BC ASBESTOS SERVICES Ltd. - *102 - 8299 - 129 St. Surrey BC V3W 0A6*

Bulk Asbestos Results

Client: Antiquity Environmental Consulting - 4325 Blackcomb - Whistler - City Hall

BCAS Sample #	Client Sample #	Date Analyzed	Sample Description	Material Type	Layer #	Layer Description	Other Materials Type & Amount	Asbestos Type & Amount
85290	#9	08-Apr-13	Photo Copy Room With Beige Paint	Drywall Filler Compound	1	Filler Compound	Non-fibrous >99 %	None Detected
					2	Paper	Cellulose 90 % Non-fibrous 10 %	None Detected
					3	Drywall	Cellulose 10 % Non-fibrous 90 %	None Detected
85291	#10	08-Apr-13	Hallway Office Beam With Yellow Paint	Drywall Filler Compound	1	Filler Compound	Non-fibrous >99 %	None Detected
85292	#11	08-Apr-13	Pony Wall Desk With Beige Paint	Drywall Filler Compound	1	Filler Compound	Non-fibrous >99 %	None Detected
85293	#12	08-Apr-13	Window Office Pony Wall With Yellow Paint	Drywall Filler Compound	1	Filler Compound	Non-fibrous >99 %	None Detected
85294	#13	08-Apr-13	Window Office With Yellow Paint	Drywall Filler Compound	1	Filler Compound	Non-fibrous >99 %	None Detected
85295	#14	08-Apr-13	Pony Wall Sep Office With Yellow Paint	Drywall Filler Compound	1	Filler Compound	Non-fibrous >99 %	None Detected
					2	Paper	Cellulose 90 % Non-fibrous 10 %	None Detected
85296	#15	08-Apr-13	Ceiling	Insulation	1	Insulating Material	Cellulose 80 % Non-fibrous 20 %	None Detected
85297	#16	08-Apr-13	Hallway Top of Pony Wall With Beige Paint	Drywall Filler Compound	1	Filler Compound	Non-fibrous >99 %	None Detected

Analytical Method: NIOSH 9002 Analyst: David Whiteside Samples submitted by: Allan

1. GENERAL

1.1 Summary

.1 This section includes requirements for supply and installation of dimensional lumber for strapping, miscellaneous blocking, plywood backing panels and blocking within gypsum board partitions for support of wall hung components and accessories.

1.2 Reference Standards

.1 American Wood Protection Association (AWPA):

.1 AWPA Book of Standards,

.2 Canadian Standards Association (CSA Group):

.1 CSA B111, Wire Nails, Spikes and Staples
.2 CAN/CSA O121, Douglas Fir Plywood
.3 CAN/CSA O141, Softwood Lumber
.4 CAN/CSA O151, Canadian Softwood Plywood
.5 CSA O325, Construction Sheathing (Adopted NIST PS 2-18, with Canadian Deviations)
.6 CSA O437 Series , Standards on OSB and Waferboard

.3 National Lumber Grading Authority (NLGA):

.1 NLGA Standard Grading Rules for Canadian Lumber

1.3 Submittals

.1 Action Submittals: Provide the following submittals before starting any work of this Section:

.1 Product data: Submit manufacturer's product data for factory fabricated products indicating component materials and dimensions and include construction and application specific details where required.

1.4 Delivery, Storage and Handling

.1 Delivery and Acceptance Requirements: Protect materials from weather in transit and on the jobsite

.2 Storage and Handling Requirements: Store materials using pallets or blocking 150 mm minimum from ground covered with protective waterproof sheets allowing for air circulation and ventilation under the covering, and as follows:

.1 Protect edges and corners of sheet materials from damage during handling and storage.
.2 Do not store seasoned materials under conditions that will cause moisture content to increase.
.3 Do not store NAUF products in contact with or in close proximity to other materials that may contain urea-formaldehyde and that have potential to contaminate NAUF products.

2. PRODUCTS

2.1 Performance Requirements

.1 Lumber Grades: Provide lumber products that are all sides finished (S4S) in nominal dimensions required for the project; grade-marked by accredited agencies of the Canadian Lumber Standards Accreditation Board and conform to Standard Grading Rules published by the National Lumber Grades Authority.

.2 Panel Grades: Provide panel products that are grade-marked by agencies recognized by CSA O325 and National Institute of Standards and Technology, Voluntary Product Standard PS 2-04 Performance Standard for Wood-Based Structural-Use Panels as modified by other listed CSA panel standards.

2.2 Materials

.1 Miscellaneous Framing, Blocking and Strapping: Provide materials meeting CAN/CSA O141 and NLGA Rules having maximum moisture content at time of dressing of 19%, consisting of species group D (SPF) Construction Grade or better.

.2 Sheathing: Provide plywood sheathing or oriented strand board at choice of Construction Manager, thickness as required by span rating and meeting requirements of CSA O325 and as follows:

.1 Plywood: Exterior Rated, Sheathing Grade square edged Douglas Fir or Canadian Softwood plywood meeting requirements of CSA O121 or CSA O151.
.2 Span Rated OSB: Exterior Rated, Sheathing Grade, oriented strand board or wafer board meeting requirements of CSA O437 SR 32/16.

2.3 Accessories

.1 Nails, Brads, and Staples: Steel nails meeting requirements of CSA B111, length to penetrate connecting solid wood materials and as follows:

.1 Exterior Work: Hot dipped galvanized
.2 Interior High Humidity Work: Hot dipped galvanized
.3 Interior Work: Electroplated zinc plated, or cadmium plated
.4 Pressure Treated Materials: Stainless steel

.2 Rough Hardware (Bolts, Nuts and Washers): Provide fasteners of size and type required for installation and as follows:

.1 Ground Contact Materials: Stainless steel.
.2 Exterior Work: Hot dipped galvanized.
.3 Interior High Humidity Work: Hot dipped galvanized.
.4 Interior Work: Electroplated zinc plated, or cadmium plated.
.5 Pressure Treated Materials: Stainless steel.

.3 Screws for Fastening to Cold Formed Metal Framing: Steel screws meeting requirements of ASTM C954, except with wafer heads and reamer wings, length as recommended by screw manufacturer for material being fastened.

.4 General Purpose Adhesives: Gun grade, cartridge loaded adhesives meeting requirements of GS-36 for Commercial Adhesive.

3. EXECUTION

3.1 Installation

.1 Set miscellaneous rough carpentry to required levels and lines with members plumb, true to line, cut, and fitted; fit miscellaneous rough carpentry to other construction; scribe and cope as needed for accurate fit; locate furring, nailers, blocking, grounds, and similar supports as required attaching to other construction.

.2 Site Waste Reduction and Management: Select lumber sizes to minimize waste, reuse scrap lumber to the greatest extent possible and as follows:

.1 Use scrap lumber for non-critical locations such as shims, bracing and blocking.

.2 Do not leave any wood, shavings, sawdust, and similar components, on the ground or buried in fill; prevent sawdust and wood shavings from entering the storm drainage system.

.3 Do not burn scraps that have been pressure treated; do not send pressure treated lumber to recycling centres, cogeneration facilities or waste-to-energy facilities.

.4 Do not burn waste lumber on site.

END OF SECTION

1. GENERAL

1.1 Summary

.1 This section includes administrative and procedural requirements for constructing an airtight building envelope that controls infiltration and exfiltration of air using a combined air and vapour retarder membrane system in accordance with the applicable Building Code.

.2 Airtight components of the building include non-moisture permeable membranes, and moisture permeable membranes as specified in Related Sections, and as indicated on the Drawings.

.3 Successful installation of the building envelope is dependent on, but is not limited to, the following:

.1 Coordination between the various contributors to the Building envelope installing, joining to, modifying, or otherwise affecting the installed building envelope.
.2 Scheduling and sequencing of the Work.
.3 Pre-construction meetings, inspections, tests, and related actions, including reviews performed by Construction Manager, inspections performed by independent agencies, and Authorities Having Jurisdiction; they do not include contract enforcement activities performed by the Consultant.

.4 Verify that the intent of constructing the Building envelope with regards to controlling air leakage into or out of conditioned spaces is achieved using training and follow-up procedures of personnel involved with installation of Building envelope materials including, but not limited to, the following characteristics:

.1 The importance of continuity of air barrier and vapour retarder system components with all joints and penetrations sealed.
.2 The concept that air barrier and vapour retarder system components must be structurally supported to withstand positive and negative air pressures applied to the Building envelope.
.3 Make penetrations to air barrier and vapour retarder systems airtight.

1.2 Reference Standards

.1 American Society of Heating, Refrigerating and Air-Conditioning Engineers (ASHRAE):

.1 Standard 90.1, Energy Standard for Buildings Except Low-Rise Residential Buildings

.2 American Society for Testing Materials (ASTM International):

.1 ASTM E96/E96M, Standard Test Methods for Water Vapor Transmission of Materials
.2 ASTM E779, Standard Test Method for Determining Air Leakage Rate by Fan Pressurization
.3 ASTM E1424, Standard Test Method for Determining the Rate of Air Leakage Through Exterior Windows, Curtain Walls, and Doors Under Specified Pressure and Temperature Differences Across the Specimen
.4 ASTM E1677, Standard Specification for an Air Barrier (AB) Material or Assemblies for Low-Rise Framed Building Walls
.5 ASTM E2178, Standard Test Method for Determining Air Leakage Rate and Calculation of Air Permeance of Building Materials
.6 ASTM E2357, Standard Test Method for Determining Air Leakage Rate of Air Barrier Assemblies

.3 Underwriters Laboratories Canada (ULC):

.1 CAN/ULC S741, Standard for Air Barrier Materials – Specifications
.2 CAN/ULC S742, Standard for Air Barrier Assemblies – Specifications

1.3 Definitions

.1 Building Envelope: Building envelope includes the airtight and moisture resistant components including joints, junctures and transitions between materials, Products, and assemblies forming the building enclosure.

.2 Vapour Retarder: Vapour retarders form an integral part of the building enclosure and must be maintained intact and continuous on the interior (warm) side of all insulated assemblies; comprised of moisture vapour impermeable membranes that are maintained in tight physical contact to the building enclosure insulation; sealed tight to all openings and penetrations and to all other elements of the Building envelope.

.3 Air Barrier: Air barriers are comprised of physically strong and reliable materials designed to resist air movement into or out of the Building envelope and resist a minimum air pressure difference of 2.0 kPa without tearing, rupturing or breaking away from its fastening; may form a part of a combined air and vapour retarder material, or may form as separate air barrier system as specified.

.4 Manufacturers' use different methods of describing the rate at which water vapour will pass through their vapour retarder materials. The three most common terms are as follows:

.1 Water Vapour Permeability: Time rate of water vapour transmission through unit area of flat material of unit thickness induced by unit vapour pressure difference between two specific surfaces, under specified temperature and humidity condition; arithmetic product of permeance and thickness that provides the property of a material.

.2 Water Vapour Permeance: Time rate of water vapour transmission through unit area of flat material or construction induced by unit vapour pressure difference between two specific surfaces, under specified temperature and humidity conditions; permeance indicates the performance of the material and is not a property of a material.

.3 Water Vapour Transmission Rate: Steady water vapour flow in unit time through unit area of a body, normal to specific parallel surfaces, under specific conditions of temperature and humidity at each surface.

.4 Metric units will be used to assess the performance of any given vapour retarder material, the following conversions will be used to assess manufacturers' product information:

Multiply	By	To Obtain (same test condition)
Water Vapour Transmission Rate (WVT)		
ng/h•m2	1.43	grains/h•ft2
grains/h•ft2	0.697	ng/h•m2
Permeance		
ng/Pa•s•m2	1.75 X 107	1 Perm (inch-pound)
1 Perm (inch-pound)	5.72 X 10-8	ng/Pa•s•m2
Permeability		
ng/Pa•s•m	6.88 X 108	1 Perm inch
1 Perm inch	1.45 X 10-9	ng/Pa•s•m
These units reflect commonly used terms only.		
All conversions of mm Hg to Pa will be made at a temperature of 0°C.		

1.4 Performance Requirements

.1 This Section describes coordination required between the various contributors to the successful installation of the Building envelope including any customized fabrication and installation procedures that may be required; this section does not cover specification requirements for Products listed in Related Sections.

.2 Common performance requirements required to maintain continuity of the Building envelope include, but are not limited to, the following:

.1 Correct installation of Products at joints and transitions to provide airtight assemblies.
.2 Specific quality control requirements for individual construction activities are specified in the sections of the specifications; verify that each contributor to the Building envelope is adequately and satisfactorily performing the quality assurance documentation, tests and procedures required by each Related Section.
.3 Specified inspections, tests, and related actions performed by the Owner do not replace the Construction Manager's quality assurance procedures required to facilitate compliance with specified requirements.

.3 Products used for air barrier and vapour retarder systems forming the building envelope shall be in accordance with the applicable Building Code and as follows:

.1 Materials:

.1 Air Barrier Materials: Air barrier membranes are designed to provide the primary resistance to air leakage into or through the building enclosure by limiting air volume to a maximum rate of 0.02 L/s•m² with a 75 Pa air pressure differential when tested in accordance with ULC S741.
.2 Vapour Impermeable Materials: Vapour barrier membranes are designed to impede water vapour transmission to rates less than 3.5 ng/Pa·s·m² when tested in accordance with ASTM E96/E96M.
.3 Vapour Permeable Materials: Vapour permeable membranes are designed to permit water vapour transmission to rates of 600 ng/Pa·s·m² or greater when tested in accordance with ASTM E96/E96M.
.4 Water Resistant Materials: No leakage in accordance with AATCC TM127.

.2 Assemblies:

.1 Air Leakage Rate for Assemblies: Pass rating, in accordance with ASTM E2357 (ambient temperature test) and ASTM E1424 (cold temperature test) as described in ULC S742.
.2 Vapour Permeance for Assemblies: 10 ng/Pa·s·m² maximum in accordance with ASTM E96/E96M where warm side Relative Humidity is greater than 55%.

1.5 Quality Assurance

.1 Coordinate work contributing to or affecting construction of the Building envelope, and sequence of construction required to attain continuity of air barrier and vapour retarder system joints, junctures and transitions between materials and assemblies of materials and Products.

.2 Use labour trained and experienced in the installation of Building envelope Products; use materials that are compatible with each other in the final construction and that will form a continuous air barrier and vapour retarder system.

.3 Provide quality assurance procedures, testing and verification required to install Building envelope as follows:

.1 Include costs for Construction Manager’s quality assurance program as a part of the Contract Price.
.2 Organize pre-construction meetings between the contributors to the Building envelope to determine extent, responsibility, and sequence of installation of airtight joints, junctures, and transitions between materials, Products and assemblies installed by the contributors to the Building envelope.

2. PRODUCTS

2.1 Not Used

3. EXECUTION

3.1 Installation

.1 Conform to the requirements of this Section to maintain and protect continuity and integrity of the Building envelope.

.2 Install air barriers and vapour retarders in full contact with substrate in accordance with manufacturer's instructions using recommended fasteners, primers or adhesives required for a complete system.

.3 Leave sufficient transition flaps of air barrier and vapour retarder materials to allow subsequent contributors to the Building envelope to complete junctions; temporarily fasten and protect transition flaps from weather, wind and damage from construction so that junctions can be completed without having to repair transition flaps and so that transition can form an airtight and vapour retardant seal.

.4 Maintain continuity of Building envelope across expansion and control joints whether indicated and designed or not.

.5 Refer to referenced related technical sections for specific requirements and any required site testing.

3.2 closeout activities

.1 Repairing:

.1 Repair damaged construction and restore substrates and finishes when inspection, testing, sample taking, and similar services have been completed in accordance with Section 01 73 29 – Cutting and Patching; repair immediately after testing and sampling is completed to prevent damage to assemblies resulting from moisture diffusion or air leakage.

.2 Protecting:

.1 Protect construction exposed during the Owner's quality control activities and repaired construction from weather and sources of moisture that are deleterious to the tested assemblies.

.2 Take all necessary precautions to prevent puncturing, tearing, weakening, or damaging the Building envelope membranes during construction; repair any damage as directed by the Consultant.

.3 Protect vapour retarder membranes from cold in final building construction using insulation.

END OF SECTION

1. GENERAL

1.1 Summary

.1 This Section provides the Common Work Results common to technical specification sections forming a part of fire rated assemblies and systems for installation by specialized Subcontractor's.

.2 This Section provides requirements for identifying fire and smoke-rated assemblies common to other assemblies that reference this Section. Supply and installation of identification and labelling components are the responsibility of the installing Subcontractor.

.3 Fire and smoke-rated assemblies and components require installation from a single source fire stop applicator or by the Construction Manager or by several fire stop applicators supervised by the Construction Manager.

.4 Design of Rated Systems is a joint responsibility of the Consultant, the Construction Manager, the manufacturer and installing Subcontractor, and the Authority Having Jurisdiction:

.1 Drawings indicate suggested solutions to fire rated separations, assemblies and materials using Standard Details based on generic information and time assigned materials listings listed in the Building Code for components required to meet the intent of the fire Rated System
.2 Drawings do not portray complete assessment of all conditions associated with fire rated separations, assemblies, and materials.
.3 Delegated design requirements of this section are included to complete the required details for the Project.
.4 Delegated design submittals are required so that the Consultant can accurately and completely fulfill the requirements for the submission of schedules required by the Authorities Having Jurisdiction.

1.2 Reference Standards

.1 American Society for Testing Materials (ASTM International):

.1 ASTM E119, Standard Test Methods for Fire Tests of Building Construction and Materials

.2 Intertek Group plc:

.1 Directory of WH Listed Building Products
.2 Directory of ETL Listed Electrical and Electronic Products

.3 National Fire Protection Association (NFPA):

.1 NFPA 80, Standard for Fire Doors and Other Opening Protectives
.2 NFPA 251, Standard Methods of Tests of Fire Resistance of Building Construction and Materials

.4 Underwriters Laboratories Inc.(UL):

.1 UL Fire Resistive Assemblies and Systems, Certified for Canada (CU_L)

.5 Underwriters Laboratories Canada (ULC):

.1 CAN/ULC S101, Standard Method of Fire Endurance Tests of Building Constriction and Materials
.2 CAN/ULC S114, Standard Method of Test for Determination of Non-Combustibility in Building Materials
.3 CAN/ULC S115, Standard Method of Fire Tests of Firestop Systems

1.3 Definitions

.1 Authority Having Jurisdiction: The local Building Code authority responsible for reviewing Engineered Judgements, Rated Systems and Mock-Ups (if any), and for inspecting installed Rated Systems for compliance with local codes and ordinances.

.2 Certified Fire Protection Specialist (CFPS): Person who has completed the NFPA sanctioned examination and professional accreditation, who is directly employed by the manufacturer, and who has direct experience in the preparation of Engineered Judgements.

.3 Engineered Judgement: A written proposal submitted by the manufacturer to the Authority Having Jurisdiction arising from a variation in the assembly or system from that tested and labelled in their Rated Systems, and as follows:

.1 Engineered Judgements are specific to this Project and details described in the written proposal and form a part of the Submittal requirements for this Section.
.2 Engineered Judgements must be signed by a CFPS and form a part of the delegated design submittal required by this section and Section 01 35 73 – Delegated Design Procedures.
.3 Engineers and Geoscientists British Columbia (EGBC) Guidelines and Advisories: Engineering Modifications to Fire-Tested and Listed Assemblies Standard of Practice.

.4 Manufacturer's Authorized Representative: A person who is directly employed by the manufacturer and who is capable of making onsite decisions relating to the installation of the manufacturers Products; this person is specifically noted as not being an employee of a distributor, agent, or other supplier.

.5 Fire-Resistance Rating: The fire-resistance rating is the time, in minutes or hours, that a materials or assembly of material will withstand the passage of flame and the transmission of heat when exposed to fire under specified conditions of test and performance criteria, or as determined by extension or interpretation of information derived therefrom as prescribed in the Building Code and as required by the Authority Having Jurisdiction. The test and acceptance criteria referred to in the Building Code are contained in a standard fire test method, CAN/ULC S101 and CAN/ULC S115.

.6 Smoke Barriers and Partitions: Sealed Barriers, partitions and other assemblies that limit the spread of smoke and toxic gases, and as follows:

.1 Assemblies: The construction of Smoke Barriers is identical to a minimum 1-hour Fire-Resistance Rating as described ins this Section. Assemblies do not require ULC Fire-Resistant Assembly Listing.
.2 Leakage Rate: Smoke Barriers require to be sealed to limit the passage of smoke and toxic gases at ambient and elevated temperatures to a maximum of 25 litres/s•m² when subjected to a pressure differential of 75 Pa at 24°C and 200°C.

.7 Fire-Protection Rating: The time, in minutes or hours, that a closure (doors, frames, door hardware, shutters, fire dampers and fire glass screens) will withstand the passage of flame when exposed to fire.

.8 Fire Compartment: Enclosed spaces in a building that are separated from all other parts of the building by enclosing construction providing a fire separation having a required fire-resistance rating.

.9 Firewall: Type of fire separation constructed of non-combustible construction that subdivides a building or separates adjoining buildings to resist the spread of fire and that has a fire-resistance rating as prescribed in the Building Code and has structural stability to remain intact under fire conditions for the required fire-rated time.

.10 Recognized Testing Authority: An organization recognized by the Authority Having Jurisdiction as being capable of conducting testing and providing labelling for materials, assemblies and systems that include, but are not limited to, the following organizations:

.1 Underwriters Laboratories of Canada (ULC).
.2 Underwriters Laboratories Inc. (UL).
.3 Warnock Hersey (intertek) and Electrical Testing Labs (ETL) Listed
.4 ETL, UL and WH labelling will only be acceptable subject to the following conditions:

.1 Fire resistance rated assemblies and materials bearing an Underwriters Laboratories Inc. (UL) or Warnock Hersey (WH) label will be acceptable for use on this project provided that the label indicates acceptance under Underwriters Laboratories of Canada (ULC) and having one of the following $_{C}$UL, $_{C}$UL$_{US}$, $_{C}$WH or $_{C}$WH$_{US}$ markings.
.2 Materials that only have UL, UL$_{US}$, WH or WH$_{US}$ markings are not acceptable.

.5 Examples of acceptable marks from Recognized Testing Authorities:

.11 Standard Details: Details prepared by the Consultant indicating an assembly based on generic materials demonstrating configuration and proposed methods for attaining the required fire rating; Standard Details may be derived from the following criteria:

.1 Details may be based on specific Rated Systems provided by a Recognized Testing Authority.
.2 Details may be based on time assigned to materials listed in the Building Code.
.3 Details are of a general nature only, sufficient to inform the bidders of the Consultant's design intent, and do not portray every instance or requirement that can be represented on the Project site; the supplier of materials is responsible submitting design information for firestopping, and smoke seal systems required for the Project to the Consultant prior to starting work.

1.4 Administrative Requirements

.1 Design fire resistive assemblies, firestopping and smoke seals required by the Contract Documents to withstand fire ratings indicated on Drawings and in accordance with requirements of the Building Code:

.1 Provide manufacturers standard details where site conditions match standard assembly listings.
.2 Provide manufacturers Engineered Judgment, indicating acceptance by the Authority Having Jurisdiction, signed by manufacturer's CFPS designer, where assembly does not match standard assembly listing.
.3 Conform Proposed Rated System materials and methods to applicable codes and ordinances of the Authority Having Jurisdiction.
.4 Additional performance requirements are listed in the referenced technical specification sections.

.2 Conform to the following requirements to maintain the continuity of fire separations whether shown on the Drawings or not:

.1 Subcontractor requires notifying the Construction Manager where assigned work penetrates through a fire separation or removes installed fire resistant materials. Subcontractor will require to repair any damage to maintain integrity of fire separations and as follows:
.2 Subcontractor must notify the Consultant before penetrating load-bearing assemblies that do not have a predetermined penetration location. fire resistance rated systems do not re-establish the structural integrity of load-bearing partitions or assemblies or support live loads and traffic.

.3 Rated Systems can be either “built-in” (such as integral with concrete placement) or “post-installed”; provide built-in Rated System devices before concrete placement or masonry installation.
.4 Coordinate sizing of sleeves, openings, core drilled holes, or cut openings to accommodate penetrations through fire and smoke-rated separations.
.5 Coordinate construction of openings and penetration items and verify that Fire Resistance Rated systems are installed according to specified requirements.

.3 Conduct a pre-installation meeting at Project site in accordance with the requirements of Section 01 31 19 – Project Meetings to discuss proposed fire-resistance rated systems supplied and installed by the Subcontractor and manufacturer, modifications to the Consultant’s Standard Details, Engineered Judgements, placement of identification labels and coordination issues, and as follows:

.1 Attendees for meetings include the Consultant, Construction Manager, installing Subcontractor’s, Manufacturer’s Authorized Representatives; the Authority Having Jurisdiction can be invited as a courtesy, but it is not mandatory that they attend the meeting.

.4 Scheduling: Schedule required site visits, submission requirements and documentation procedures, review of Mock-Ups (if any) and inspection of fire and smoke rated assemblies as follows:

.1 Authority Having Jurisdiction: Notify Authority Having Jurisdiction in sufficient time to allow for inspection prior to Fire-Resistance Rated systems being covered up or enclosed.

.5 Sequencing: Sequence installation of fire and smoke rated components to maintain the continuity of fire separations whether shown on the drawings or not:

.1 Fire separations may not be pierced by electrical or similar service outlets except in accordance with Building Code.
.2 Do not support non-combustible construction on combustible construction.
.3 Fire Stop openings in non-combustible construction that terminates at the exterior wall, the underside of floor, ceiling, or roof structures, and at floors with non-combustible materials.
.4 Do not use combustible members, fastenings, and similar items to anchor fixtures to fire separations.
.5 Fire Stop openings for non-combustible pipes and ducts to prevent the passage of smoke and flame.

1.5 Submittals

.1 Submit a summary of Rated Systems proposed for use in the Project within four (4) weeks of starting work of the Contract and as follows:

.1 Provide summary of manufacturer’s details and Engineered Judgements in a format similar to that attached to the end of this Section
.2 Attach detailed sketches and drawings, manufacturer’s written installation instruction, and material safety and data sheets to the summary; fully cross referenced to the Drawings and the summary.
.3 Manufacturer’s Details:

.1 Submit manufacturer’s details indicating an assembly or system that matches the design intent provided by the Standard Details
.2 Provide additional details as required to address additional detail conditions not covered by the Standard Details.

.4 Engineered Judgements (EJ):

.1 Manufacturer’s details indicating a modification to an assembly or system required to meet the design intent provided by the Standard Details or to address a specific site condition not normally test for in the manufacturer’s testing program.
.2 Engineered Judgments must include project name and Subcontractor’s name who will install Rated System described in the Engineered Judgement.

.3 Engineered Judgements must be signed by a CFPS employed by the manufacturer, and who was directly responsible for preparation of the Engineered Judgement.

.4 Prepare Engineered Judgements in accordance with IFC Guidelines for Evaluating Firestop Systems Engineering Judgements.

.5 Equivalent Fire Resistance Rated Assembly (EFRRA): Fire-Resistance Rated Assemblies that are submitted by a Fire Stop manufacturer using similar materials and configurations as components from a competing Fire Stop manufacturer, but that has not been tested by the submitting Fire Stop manufacturer:

.1 An EFRRA is not qualified by exactly representative fire testing but will be viewed as an acceptable solution provided that an engineering assessment is performed by the Fire Stop manufacturer.

.2 EFRRAs will be administered the same as EJs as described in this Section.

.2 Delegated Design Submittals: Submit Model Schedule S-B and Model Schedule S-C for EJ and EFRRA designs in accordance with Section 01 35 73 – Delegated Design Procedures, and as follows:

.1 Submit Model Schedule S-B and Model Schedule S-C concurrently with preliminary shop drawings indicating supporting professional engineer's limitation of design responsibilities.

.2 Submit Model Schedule S-B and Model Schedule S-C concurrently with site report indicating supporting professional engineer's assessment that installation is substantial compliant with system design indicated on shop drawings

1.6 Quality Assurance

.1 Coordination of Related Work: Quality Assurance requirements specific to Fire-Resistance Rated assemblies, materials and components must be read in conjunction with requirements of this Section to form a complete requirement for the Project.

.2 Quality Assurance Program: Subcontractor are response for establishing a Quality Assurance program in accordance with FCIA Manual of Practice, assemble a listing of proposed Fire Stop systems and assemblies required for the project, and submit required certificates at completion of the Project that work associated with Fire and Smoke assemblies has been completed in accordance with referenced standards, and with specifications.

.3 Installers: Fire-Resistance Rated systems specified for the Project will be supplied and installed by a Subcontractor specializing in the application of specific systems and that have completed training in a ULC or FM Fire Stop training and certification program, and as follows:

.1 Fire Stopping: Specified in Section 07 84 00 – Firestopping for mechanical and electrical penetrations, floor, and wall openings, top-of-wall seals, perimeter building seals and re-enterable cable management systems.

.4 Manufacturer's Site Services: Manufacturer's authorized representative (not distributor or agent) will be onsite during initial installation of Fire-Resistance Rated systems to train Subcontractor's personnel in proper selection and installation procedures in accordance with manufacturer's written recommendations.

2. PRODUCTS

2.1 Performance Requirements

.1 Provide Rated Systems identical to those tested in assembly indicated by the Recognized Testing Authority; provide Engineered Judgements for systems that do not match the Rated Systems.

.2 Provide a label and proof of fire resistive materials used in Rated Systems issued by a Recognized Testing Authority.

.3 Refer to technical sections for specific requirements for sealing penetrations and joints of smoke and fire separations.

2.2 Materials

.1 Provide Rated Systems composed of components that are compatible with each other, the substrates they are applied to, and the items (if any) penetrating the Rated System under conditions of service and application as demonstrated by the manufacturer based on testing and site experience.

.2 Provide complete components for each Rated System that are needed to properly install material forming the system; use only components specified by the manufacturer and approved by the Recognized Testing Agency for the designated fire resistance rated systems.

2.3 Identification Materials

.1 Adhesive Labels: Nominal 75 mm high x 125 mm wide self-adhering labels placed adjacent to fire and smoke rated penetration components, printed with the following information:

.1 ATTENTION: FIRE RATED PENETRATION ASSEMBLY DO NOT MODIFY
HOUR RATING AND CLASS OF PENETRATION ASSEMBLY
.2 Name of Fire Stopping manufacturer.
.3 Names of products used.
.4 Manufacturers standard detail number, or Engineering Judgement identifier; ULC or $_{C}$UL Number.
.5 Date Installed.
.6 Subcontractor's Name.
.7 Installer's Name.
.8 Phone number for repair or replacement of Fire Stopping materials.
.9 QR Code for easy information retrieval.
.10 Placement: Place self-adhering labels on a permanent surface adjacent to Fire Stopping installation in an inconspicuous location in fully finished areas, and as follows:

.1 Acceptable locations include areas such as within concealed ceiling spaces, above cable trays, out of direct line-of-sight beside penetrations and similar locations.
.2 Confirm locations before final placement.

.11 Example:

.2 Stencil Signs: Nominal 300 mm high by 400 mm wide painted and stencilled permanent signage applied to fire walls, fire barriers and partitions, smoke barriers and partitions and other wall or floor assemblies containing protected openings and penetrations labelled with the following information:

.1 ATTENTION: FIRE RATED BARRIER – PROTECT ALL OPENINGS
HOUR RATING OF ASSEMBLY

OR (as appropriate to installation)

ATTENTION: SMOKE RATED BARRIER – PROTECT ALL OPENINGS

.2 Placement: Apply stencilled signage to wall or barrier surface at 10 metre intervals, evenly laid out across the length of the assembly at a concealed locations and as follows:

.1 Acceptable locations include areas such as above finished ceilings, or out of direct line-of-sight in finished public spaces.

.2 Acceptable exposed locations include areas such as within unoccupied spaces, mechanical and electrical rooms and similar unfinished non-public spaces.

.3 Confirm locations before final placement.

.3 Self-adhering labels containing similar information and sized similarly to site stencilled signage are considered as an acceptable substitution for stencilled and painted signage.

.4 Example:

3. EXECUTION

3.1 Responsibilities Of Parties Involved

.1 The Consultant is responsible for the following:

.1 Provide Standard Details of Fire-Resistance Rated systems for the guidance of the Construction Manager, Subcontractors, and Authority Having Jurisdiction; Standard Details represent design intent only, and do not portray every condition that may arise in the construction process.

.2 Review manufacturer's submittals for conformance to design intent to comply with the Consultant's requirements for completing schedules required by the Building Code.

.2 The Construction Manager is responsible for the following:

.1 Direct Subcontractors responsible for installation of Fire-Resistance Rated systems to submit a summary of Fire-Resistance Rated systems used in the project for submission to the Authority Having Jurisdiction and the Consultant.

.2 Direct Subcontractors responsible for installation of Fire-Resistance Rated systems to complete any Mock-Ups required by the technical specification sections ready for review by the Authority Having Jurisdiction and the Consultant.

.3 Direct the Subcontractor to submit Model Schedule S-B and Model Schedule S-C to the Consultant.

.4 Direct the Subcontractor to notify the Authority Having Jurisdiction to inspect installed Fire-Resistance Rated systems.

.3 The Authority Having Jurisdiction will be responsible for the following:

.1 Review manufacturer's submittals for compliance with local codes and ordinances submitted by Consultant, when requested by the Authority Having Jurisdiction.

.2 Review Mock-Ups for compliance with local codes and ordinances when they are able to attend (optional attendance).

.3 Review of installed Fire-Resistance Rated systems for compliance with local codes and ordinances.

3.2 Site Quality Control

.1 Manufacturer's Site Services: Refer to RELATED REQUIREMENTS for relating to manufacturer's site review and reporting requirements, and as follows:

.1 Notify Consultant a minimum of seven days in advance of completion of installation of fire and smoke Fire-Resistance Rated systems and Fire Stop installations; confirm dates and times on days preceding each series of installations.

.2 Do not cover up fire and smoke rated construction or Fire Stop systems that will become concealed behind other construction until Consultant has reviewed, and Authority Having Jurisdiction's building inspector have examined each installation.

.2 Cut tests may be made at random; the Consultant will determine the frequency of cut tests, but will not be more than 1% of total length of Fire Stopping:

.1 Make all necessary repairs and correct all deficiencies noted after completion of cut tests.

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1.1 Sample Summary Form

.3 The following Sample Summary Form can be used to develop the listing of Fire-Resistance Rated systems required for the Project as noted in Item 1.5.1 above:

RATED SYSTEM SUMMARY SHEET			
Project Name:			Date:
Project Address:			
Installing Subcontractor:			Telephone:
Installer's Address:			
Submitted to: S2 Architecture			
SPRAY APPLIED FIRE RESISTIVE MATERIALS			
Type of Assembly: Wall, Floor, Roof or Ceiling	**Combustible or Non-Combustible Assembly**	**Rating: Time, Restraint or Unrestrained**	**Design or Listing Number**
CONCRETE FIRE PENETRATIONS – HORIZONTAL OR VERTICAL (FT RATING)			
Type of Penetration	**Combustible or Non-Combustible Penetrating Material**	**FT Rating**	**Design or Listing Number**
Water Distribution			
Sprinkler Piping			
Drain Waste and Vent (DWV) Piping			
Gas Piping			
HVAC Ducts (Not requiring Dampers)			
Electrical Cables (Diameter >25 mm)			
Electrical Metallic Tubing (EMT) or Steel Conduit			
Other Penetrations			

RATED SYSTEM SUMMARY SHEET			
Project Name:			Date:
Project Address:			
Installing Subcontractor:			Telephone:
Installer's Address:			
Submitted to: S2 Architecture			
PENETRATIONS THROUGH FLOOR ASSEMBLIES			
Type of Penetration	**Combustible or Non-Combustible Penetrating Material**	**F Rating**	**Design or Listing Number**
Water Distribution			
Sprinkler Piping			
Drain Waste and Vent (DWV) Piping			
Gas Piping			
HVAC Ducts (Not requiring Dampers)			
Electrical Cables (Diameter >25 mm)			
Electrical Metallic Tubing (EMT) or Steel Conduit			
Other Penetrations			

RATED SYSTEM SUMMARY SHEET			
Project Name:			Date:
Project Address:			
Installing Subcontractor:			Telephone:
Installer's Address:			
Submitted to: S2 Architecture			
PENETRATIONS THROUGH WALL ASSEMBLIES			
Type of Penetration	**Combustible or Non-Combustible Penetrating Material**	**F Rating**	**Design or Listing Number**
Water Distribution			
Sprinkler Piping			
Drain Waste and Vent (DWV) Piping			
Gas Piping			
HVAC Ducts (Not requiring Dampers)			
Electrical Cables (Diameter >25 mm)			
Electrical Metallic Tubing (EMT) or Steel Conduit			
Other Penetrations			
PERIMETER SEALS, TOP-OF-WALL DETAILS AND OTHER FIRE STOPPING			
Type of Penetration	**Combustible or Non-Combustible Material**	**FT or F Rating**	**Design or Listing Number**

END OF SECTION

1 GENERAL

1.1 Summary

.1 Provide building insulation in accordance with requirements of Contract Documents.

1.2 References

.1 ASTM International (ASTM):

.1 ASTM C177, Standard Test Method for Steady-State Heat Flux Measurements and Thermal Transmission Properties by Means of the Guarded-Hot-Plate Apparatus.
.2 ASTM C518, Standard Test Method for Steady-State Thermal Transmission Properties by Means of the Heat Flow Meter Apparatus.
.3 ASTM C578 Standard Specification for Rigid, Cellular Polystyrene Thermal Insulation
.4 ASTM C612, Standard Specification for Mineral Fiber Block and Board Thermal Insulation.
.5 ASTM C1015, Standard Practice for Installation of Cellulosic and Mineral Fiber Loose-Fill Thermal Insulation.
.6 ASTM C1303/C1303M, Standard Test Method for Predicting Long-Term Thermal Resistance of Closed-Cell Foam Insulation.
.7 ASTM D1621, Standard Test Method for Compressive Properties of Rigid Cellular Plastics
.8 ASTM D1622/C1622M, Standard Specification for Cold-Weather Admixture Systems.
.9 ASTM D2842, Standard Test Methods for Water Absorption of Rigid Cellular Plastics
.10 ASTM D5113, Standard Test Method for Determining Adhesive Attack on Rigid Cellular Polystyrene Foam
.11 ASTM D6226, Standard Test Method for Open Cell Content of Rigid Cellular Plastics.
.12 ASTM E84, Standard Test Method for Surface Burning Characteristics of Building Materials.
.13 ASTM E96/E96M, Standard Test Methods for Gravimetric Determination of Water Vapor Transmission Rate of Materials

.2 Canadian Construction Materials Centre (CCMC)

.3 Canadian General Standards Board (CGSB):

.1 CGSB 71-GP-24M, Adhesive, Flexible, for Bonding Cellular Polystyrene (withdrawn)

.4 Underwriters Laboratories Canada (ULC):

.1 CAN/ULC S102, Method of Test for Surface Burning Characteristics of Building Materials and Assemblies
.2 CAN/ULC S114, Test for Determination of Non-Combustibility in Building Materials
.3 CAN/ULC S129, Standard Method of Test for Smoulder Resistance of Insulation (Basket Method)
.4 CAN/ULC S701.1, Standard forThermal Insulation, Polystyrene Boards
.5 CAN/ULC S702, Standard for Mineral Fibre Thermal Insulation for Buildings
.6 CAN/ULC S704, Standard for Thermal Insulation, Polyurethane and Polyisocyanurate Boards, Faced
.7 CAN/ULC S705.1, Standard for Thermal Insulation - Spray Applied Rigid Polyurethane Foam, Medium Density - Material – Specification.
.8 CAN/ULC S705.2, Standard for Thermal Insulation - Spray Applied Rigid Polyurethane Foam, Medium Density – Application.
.9 CAN/ULC S770, Standard Test Method for Determination of Long-term Thermal Resistance of Closed-Cell Thermal Insulating Foams

1.3 Submittals

.1 Product Data: Submit for Consultant’s action. Furnish each type of product and accessories to be used in the Work; before starting work of this section.

.1 Manufacturer's literature, specifications and installation instructions describing general properties of each material and accessory used in the Work.

1.4 Quality Assurance

.1 Regulatory Requirements: Provide insulation products that meet or contain less than the regulated limits for Ozone Depletion Potential compounds listed in the Montreal Protocol adopted by the United Nations Environmental Program.

.2 Qualifications: Provide proof of qualifications for spray applied insulation when requested by Consultant:

.1 Manufacturer: Obtain air and vapour seal materials from a single manufacturer regularly engaged in manufacturing the products specified in this Section.
.2 Installers: Use companies that are members and licensed CUFCA or manufacturers' quality assurance training program having trained and certified installers in accordance with CAN/ULC S705.2 and CUFCA or manufacturers' quality assurance training program requriements.

1.5 Delivery, Storage and Handling

.1 Storage and Handling Requirements:

.1 Protect insulation materials from physical damage and from deterioration by moisture, soiling, and other sources. Store inside and in a dry location. Comply with manufacturer's written instructions for handling, storing, and protecting during installation.

2. PRODUCTS

2.1 Manufacturers

.1 Acceptable Products Manufacturers: Subject to compliance with requirements specified in this Section, use any of the following listed manufacturers' products, provided required product data and shop drawing are submitted before starting any work of this Section:

.1 Johns Manville
.2 Owens-Corning Canada
.3 Rockwool Inc.

.2 Substitutions: Additional manufacturers offering similar products to Acceptable Products Manufacturers listed above may be incorporated into the work provided they meet the performance requirements established by the named products and provided they submit requests for substitution.

2.2 Materials

.1 Semi-rigid insulation board; cavity wall assemblies: Mineral-fibre to CAN/ULC S702-09, Type 1, either dual density or mono density to ASTM C612. Flame spread 0 to ULC S102, non combustible to ULC S114; thermal resistance to ASTM C518 R4.3/ inch (RSI 0.75 0.75 m^2K/W for 25.4 mm thickness)

.1 Acceptable Materials:

.1 CavityRock by Rockwool..
.2 Cladstone Water & Fire Block Insulation – 6.0 PCF by Johns Manville.
.3 Thermafiber RainBarrier 45 by Owens Corning.

.2 Fibrous Mineral Wall Insulation (semi-rigid): use at "screw thru type method" where strapping is being used.

.1 ROCKWOOL Comfortboard 80 (wood stud) Comfortboard 110 (steel stud)
.2 Thermafibre HD max by Owens Corning

.1 High−Density Glass Fiber Board: ASTM C612, Type 1. Rigid glass fiber board with water−resistant binders. ASTM C518, thermal conductivity of “k” = 0.23 Btu in./hr. ft.2 F (0.033 W/m degrees C) at 75F (24C). Nominal 6 pcf (96 kg/m^3) density. ASTM E84 and CAN/ULC S102, flame spread 25, smoke developed 50, or less. Provide manufacturer’s standard sizes in thickness and thermal resistance “R” values indicated. Unfaced Board: Locations: refer to Drawings

.1 Owens−Corning “Fiberglas 705”
.2 CertainTeed “Commercial Board Insulation CB600”
.3 ROCKWOOL ROCKBOARD 60.

2.3 Accessories

.1 Insulation Fasteners:

.1 Mechanical Fasteners: High quality, impact resistant plastic fastener system specifically designed for installation of board insulation materials; 38 mm diameter, shaft length to suit insulation thickness and hot dipped galvanized fastener to suit substrate, and as follows:

.1 Basis-of-Design Materials: Ucan Fastening Systems, Insulation Fasteners; alternates will be considered for this material.

.2 Perimeter Insulation Flashings: Coordinate supply of end closures and flashings for perimeter insulation system with Section 07 62 00.

.3 Supports and Anchors for Insulation: Provide type shown and as recommended by insulation manufacturer. Provide galvanized steel skewers or mechanically attached clips as recommended by the insulation manufacturer when insulation is applied to metal construction.

3. EXECUTION

3.1 Site Conditions

.1 Weather Conditions: Do not proceed with the exterior exposed Work during inclement weather nor when weather forecasts are unfavorable, unless the Work will proceed in accordance with the manufacturer’s requirements and instructions and any agreements or restrictions of the Pre−Construction Conference.

3.2 Examination

.1 Examine substrates and conditions for compliance with requirements for Sections in which substrates and related work are specified and other conditions affecting performance.

.2 Verify that all surfaces which are to receive rigid insulation are clean, free of deleterious matter and are sufficiently level to allow the proper installation of insulation.

.3 Verify that all flashings provided under other Sections are installed and that they divert moisture to exterior of insulated systems.

3.3 Preparation

.1 Clean substrates of substances harmful to insulations; remove projections that interfere with insulation attachment.

.2 Proceed with installation only after unsatisfactory conditions have been corrected.

3.4 Installation

.1 General: Install the insulation materials in accordance with the manufacturers’ instructions, except where more stringent requirements are shown or specified. Extend insulation full thickness over entire area to be covered unless otherwise shown. Cut and fit or form insulation tightly around all obstructions and penetrations so that no voids exist in the insulation course.

.2 Insulation in Fire−Rated Systems: Refer to Section 07 84 00 for materials to be used in fire rated construction for through−penetrations, firestop joints, and perimeter fire containment systems.

.3 Mechanical Attachment: Provide type and spacing of mechanical anchoring devices as shown and as recommended by the insulation manufacturer for the thickness and condition of use shown.

.4 Adhesively Applied Clips and Skewers: Provide adhesive and spacing of clips or skewers as recommended by the manufacturer for the condition and substrate indicated.

3.5 Protection

.1 Protect installed board insulation from damage due to harmful weather exposures, physical abuse, and other causes.

.2 Provide temporary coverings or enclosures where insulation is subject to abuse and cannot be concealed and protected by permanent construction immediately after installation.

END OF SECTION

1. General

1.1 SUMMARY

.1 Provide self-adhered water resistive vapour permeable membrane in accordance with requirements of the Contract Documents.

1.2 REFERENCES

.1 ASTM International (ASTM):

.1 ASTM D5034 - Test Method for Breaking Strength and Elongation of Textile Fabrics (Grab Test).
.2 ASTM E84 - Test Method for Surface Burning Characteristics of Building Materials.
.3 ASTM E96/E96M - Test Methods for Water Vapor Transmission of Materials.
.4 ASTM E398 - Standard Test Method for Water Vapor Transmission Rate of Sheet Materials Using Dynamic Relative Humidity Measurement.
.5 ASTM E2178 - Standard Test Method for Air Permeance of Building Materials.
.6 ASTM E2357 - Standard Test Method for Determining Air Leakage Rate of Air Barrier Assemblies.

.2 American Association of Textile Chemists and Colorists (AATCC): ATCC 127 - Test Method for Water Resistance: Hydrostatic Pressure Test.

.3 International Code Council Evaluation Service, Inc. (ICC-ES): ICC-ES AC38 - Acceptance Criteria for Water-Resistive Barriers.

1.3 SUBMITTALS

.1 Submit manufacturers' current product data sheets, details and installation instructions for the water-resistive vapor permeable air barrier membrane components and accessories.

.2 Submit samples of the following:

.1 Manufacturer's sample warranty
.2 Water-resistive vapor permeable air barrier sheet, minimum 8 by 10 inches (203 by 254 mm)
.3 Components, minimum 12 inch (305 mm) lengths
.4 Membrane flashings
.5 Fasteners, clips, strapping, cladding attachment fasteners and masonry ties
.6 Sealants

1.4 QUALITY ASSURANCE

.1 Single Source: Self-adhered water-resistive vapor permeable air barrier membrane components and accessories must be obtained as a single-source membrane system to ensure total system compatibility and integrity.

.2 Manufacturer Qualifications

.1 Manufacturer of specified products listed in this Section to have minimum 10 years of continued experience in the manufacture and supply of highly vapor permeable water resistive air barrier products successfully installed in similar project applications.
.2 Manufacturer of specified products listed in this Section to have experienced in-house technical and field observation personal qualified to provide expert technical support.

.3 Fire Performance Characteristics: Provide water-resistive barrier meeting the following fire-test characteristics.

.1 Surface-Burning Characteristics: ASTM E84
.2 Flame spread index: 5 or less
.3 Smoke developed index: 15 or less

1.5 PRE-INSTALLATION CONFERENCE

.1 Contractor shall convene one week prior to commencing work of this section, under provisions of Division 01.

.2 Ensure all contractors responsible for creating a continuous plane of water and air tightness are present.

1.6 DELIVERY, STORAGE AND HANDLING

.1 Refer to current product manufacturer's literature for proper storage and handling.

.2 Deliver materials to the job site in undamaged and original packaging indicating the name of the manufacturer and product.

.3 Store roll materials on end in original packaging. Protect rolls from direct sunlight and inclement weather until ready for use.

.4 Waste Management and Disposal

.1 Separate and recycle waste materials in accordance with contract documents.

1.7 COORDINATION

.1 Ensure continuity of the fully self-adhered water-resistive vapor permeable air barrier system throughout the scope of this section.

.1 Air barrier vapor permeable membrane to include self-adhered air barrier, transition membranes and sealants at penetrations.
.2 Drainage plane to include drainage cavity, water resistive barrier and flashings to the exterior.

2. Products

2.1 MATERIALS

.1 Primary fully self-adhered air barrier sheet membrane: zero VOC fully self-adhered vapor permeable air barrier sheet membrane consisting of multiple layers of spun-bonded polypropylene tested in accordance with ICC-ES AC38 criteria to meet IBC and IRC requirements for weather resistive barriers having the following properties:

.1 Color: manufacturer's standard with allowable UV exposure for 180 days, prior to coverage.
.2 Breaking strength and Elongation to ASTM D5034: 88 lbf (391 N), machine direction; 83 lbf (369 N), cross-machine direction.
.3 Water Vapor Permeance tested to ASTM E96/E96M, Method B: minimum of 50.45 perms (2886 ng/Pa.s.m^2)
.4 Water Vapor Permeance tested to ASTM E398: minimum of 52.57 perms (3007 ng/Pa.s.m^2)
.5 Air Leakage: ≤0.00002 cfm/ft^2 @ 1.57 psf (≤0.0001 L/s m^2 @ 75 Pa) when tested in accordance with ASTM E2178 and <0.01 cfm/ft^2 @ 1.57 psf (<0.01 L/s m^2 @ 75 Pa)) when tested in accordance with ASTM E2357 and. Meets Air Barrier Association of America (ABAA) requirements for "Adhesive Backed Commercial Building Wraps".
.6 Water Resistance tested to AATCC 127, 550 mm hydrostatic head for 5 hours: No leakage
.7 Application Temperature: Ambient temperature must be above 20 °F (minus 6.7 °C)
.8 Surface Burning Characteristics tested to ASTM E84: Class A, Flame-spread index of less than 5, Smoke-developed index of less than 15
.9 Physical Dimensions: 0.022 inches (0.56 mm) thick and 59 inches (1.5 m) wide and 7.58 oz/yd^2 (257 g/m^2).

.2 Acceptable Materials:

.1 Henry Blueskin VP160
.2 GCP Applied Technologies, Perm-A-Barrier VPS
.3 IKO Aqua Barrier VP
.4 Soprema Sopraseal stick VP
.5 Resista Red Zone Stick VP
.6 Protecto Wrap PW 100/40
.7 Vapro Shield, Wrap Shield SA
.8 Air-Shield SMP by WR Meadows
.9 Tremco EXOAir 430 or 330
.10 Perm-A-Barrier VPS as manufactured by GCP Applied Technologies.
.11 3M 3015VP

.3 Thru-wall Flashing membrane (self-adhering type). One of the following approved equals and associated accessories:

.1 Perm-A-Barrier WF as manufactured by GCP Applied Technologies.
.2 Tremco ExoAir TWF
.3 CCW-705-TWF as manufactured by Carlisle
.4 Blue Skin TWF as manufactured by Henry Inc.
.5 IKO Aquabarrier TWF
.6 Soprema Sopraseal WFM or 1100HT
.7 Air-Shield TWF by WR Meadows
.8 3M 3015 TWF
.9 Note that only one type is to be used throughout the project.

3. Execution

3.1 GENERAL

.1 Verify that surfaces and conditions are ready to accept the work of this section. Notify consultant in writing of any discrepancies. Commencement of the work or any parts thereof shall mean acceptance of the prepared substrates.

.2 All surfaces must be dry, sound, clean, free of oil, grease, dirt, excess mortar or other contaminants detrimental to the adhesion of the water resistive air barrier membrane and flashings. Fill voids and gaps in substrate greater than $^{7}/_{8}$ inch in width to provide an even surface. Strike masonry joints full-flush.

.3 Minimum application temperature of fully self-adhered membrane and flashings to be above 20 °F (minus 6.0 °C).

.4 Ensure all preparatory Work is complete prior to applying primary fully self-adhered vapor permeable air barrier sheet membrane.

.5 Mechanical fasteners used to secure sheathing surfaces or penetrate sheathing surfaces shall be set flush with sheathing, fastened into solid backing and covered with the upper overlapping membrane. If exposed fasteners are present on the surface of the membrane, cover and seal with manufacturer recommended material.

3.2 COORDINATION OF SELF-ADHERED VAPOR PERMEABLE AIR BARRIER MEMBRANE INSTALLATION

.1 Download Installation Instructions from manufacturer.

.2 Installation Summary:

.1 Self-adhered vapor permeable air barrier sheets may be installed vertically or horizontally over the outside face of exterior sheathing board or other approved substrates.
.2 Complete detail work at; wall openings, building transitions and penetrations prior to field applications.

.3 Install fully self-adhered vapor permeable air barrier sheet over the outside face of exterior sheathing board or substrate, measure and pre-cut into manageable sized sheets to suit the application conditions.

.4 Install fully self-adhered vapor permeable air barrier sheet complete and continuous to substrate in a sequential minimal 3 inch (76 mm) overlapping weatherboard.

.5 Stagger all end lap seams.

.6 Roll installed membrane with roller to ensure positive contact and adhesion with substrate immediately.

3.3 BUILDING TRANSITION CONDITIONS

.1 Tie-in to structural beams, columns, floor slabs and intermittent floors, parapet curbs, foundation walls, roofing systems and at the interface of dissimilar materials with self-adhering air barrier transition and flashing membrane.

.2 Align and position fully self-adhered air barrier transition and flashing membrane, remove protective film and press firmly into place. Provide minimum 3 inch (76 mm) lap on to substrates.

.3 Ensure minimum 3 inch (76 mm) overlap at side and end laps of membrane and 6 inch (152.4 mm) at inside and outside corners, if joints occur at corner locations.

.4 Roll membrane and lap seams with roller to ensure positive contact and adhesion, immediately.

3.4 VERTICAL APPLICATIONS SUMMARY

.1 For vertical applications, align sheets with an ‘inside’ or ‘outside’ corner to avoid wrinkles and misalignment of subsequent applications.

.2 Measure and pre-cut into manageable sized fully self-adhered sheets to suit the application conditions.

.3 Allow for excess material at bottom of wall to accommodate tie-ins and connections to adjacent surfaces.

.4 Roll up pre-cut material lengths with release paper facing OUTWARD.

.5 Starting at a corner of the roll, peel back approx. 6” (152.4 mm) of release film from across the width of the pre-cut material roll.

.6 Using hand pressure, lightly apply the exposed adhesive surface to the substrate.

.7 Allow the rolled up material to drop down the wall, with the remainder of the release film still attached (facing the wall), and extend down to lowest point of wall, checking for proper alignment, repositioning as necessary.

.8 Allow for excess material at bottom of wall to accommodate tie-ins and connections to adjacent surfaces.

.9 Align and position fully self-adhered membrane, remove release film and press firmly into place. Provide minimum 3 inch (76 mm) overlap at side and end laps of membrane.

.10 Continue to remove release film and apply pressure to ensure positive contact onto wall substrate.

.11 Install subsequent sheets of fully self-adhered vapor permeable air barrier sheets in overlapping weatherboard format. Ensure sheets lay smooth and flat to surfaces. Roll membrane and lap seams with two handed roller to ensure contact and adhesion.

3.5 FASTENING CLIPS AND MASONRY TIES

.1 Install clips and masonry ties over primary self-adhered vapor permeable air barrier membrane.

.2 Secure clips and masonry ties with corrosion-resistant, or stainless steel screws with gasketed fasteners.

3.6 FIELD QUALITY CONTROL

.1 Make notification when sections of work are complete to allow review prior to covering fully self-adhered water-resistive vapor permeable air barrier system.

.2 Owner to engage independent consultant to observe substrate and membrane installation prior to placement of cladding system(s) and provide written documentation of observations.

3.7 PROTECTION

.1 Protect wall areas covered with self-adhered water-resistive vapor permeable air barrier from damage due to construction activities, high wind conditions, and extended exposure to inclement weather.

.2 Review condition of fully self-adhered water-resistive vapor permeable air barrier prior to installation of cladding. Repair, or remove and replace damaged sections with new membrane.

.3 Recommend to cap and protect exposed back-up walls against wet weather conditions during and after application of membrane, including wall openings and construction activity above completed fully self-adhered water-resistive vapor permeable air barrier installations.

.4 Remove and replace water-resistive weather barrier membrane affected by chemical spills or surfactants.

END OF SECTION

1. GENERAL

1.1 Summary

.1 Provide Mineral Fibre Reinforced Cement Siding in accordance with the requirements of the Contract Documents.

1.2 References

.1 ASTM International (ASTM):

.1 ASTM A653/A653M, Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.
.2 ASTM C1186, Standard Specification for Flat Fiber-Cement Sheets.
.3 ASTM D3359 - Standard Test Method for Rating Adhesion by Tape Test.
.4 ASTM E84, Standard Test Method for Surface Burning Characteristics of Building Materials.
.5 ASTM E136, Standard Test Method for Assessing Combustibility of Materials Using a Vertical Tube Furnace at 750 oC.

.2 Canadian General Standards Board (CGSB):

.1 CAN/CGSB 34.4, Siding, Asbestos-Cement, Shingles and Clapboards (withdrawn)

Consultant is aware that fibre reinforced cement siding products do not contain asbestos fibre, however, the national standard of Canada still references Asbestos-Cement, which contains relevant information with respect to the installation of products specified in this Section.

.3 Underwriters Laboratories of Canada (ULC):

.1 CAN/ULC S102, Standard Method of Test for Surface Burning Characteristics of Building Materials and Assemblies
.2 CAN/ULC S114, Standard Method of Test for Determination of Non-Combustibility in Building Materials

1.3 Submittals

.1 Product Data: Submit for Consultant’s action product data for each type of product indicated.

.2 Samples: Submit for Consultant’s action samples for verification for each type, colour, texture, and pattern required, as follows:

.1 300 mm long x actual width sample of siding.
.2 300 mm long x actual width sample of trim.

1.4 Quality Assurance

.1 Source Limitations: Obtain each type, colour, texture, and pattern of siding including related accessories, through one source from a single manufacturer.

1.5 Delivery, Storage and Handling

.1 Store materials in a dry, well ventilated, weather tight location in accordance with manufacturers written instructions.

1.6 Site Conditions

.1 Proceed with siding installation when substrate is completely dry and where existing and forecasted weather conditions permit siding to be installed according to manufacturer's written instructions.

1.7 Sequencing

.1 Coordinate installation with flashings and other adjoining construction to ensure proper sequencing.

2. PRODUCTS

2.1 Manufacturers

.1 Acceptable Products Manufacturers: Subject to compliance with requirements specified in this Section, use any of the following listed manufacturers' products, provided required product data and shop drawing are submitted before starting any work of this Section:

.2 Subject to compliance with requirements, products that may be incorporated into the Work include materials manufactured by, but not limited to, the following:

.1 James Hardie Inc.

.3 Substitutions: Additional manufacturers offering similar products to Acceptable Products Manufacturers listed above may be incorporated into the work provided they meet the performance requirements established by the named products and provided they submit requests for substitution.

2.2 Materials

.1 Fiber Cement Board - General: consist of cement, recycled content and cellulose fiber formed under high pressure into boards with integral surface texture; complying with ASTM C 1186 Type A Grade II; machined edges; for nail attachment.

.1 Surface Burning Characteristics: Flame spread index of 0, smoke developed index of 5, maximum; when tested in accordance with ASTM E 84 (Class I/A).
.2 Flammability: Noncombustible, when tested in accordance with ASTM E 136.
.3 Flexural Strength: At least 1450 psi (10 MPa) when in equilibrium condition, and at least 1015 psi (7 MPa) when in wet condition, tested in accordance with ASTM C 1185.
.4 Coefficient of Thermal Expansion: Less than 1 x 10^-5/inch/inch/degree F (0.5 x 10^-5/degree C), when tested in accordance with ASTM E 228.
.5 Freeze Thaw Resistance: At least 80 percent flexural strength retained, when tested in accordance with ASTM C 1185.
.6 UV Resistance: No cracking, checking, or erosion, when tested for 2000 hours in accordance with ASTM G 26.
.7 Water Tightness: No water droplets on underside, when tested in accordance with ASTM C 1185.

2.3 Siding

.1 Horizontal Fibre Cement Siding: Siding made from fibre reinforced cement board, free from asbestos fibres; in accordance with ASTM C1186, Type A, Grade II; classified as non-combustible in accordance with ASTM E136; and having flame spread index of 0 and smoke developed index 5 in accordance with ASTM E84, having the following characteristics:

.1 Size: as indicated on Drawings.
.2 Factory Finish: factory applied finish as selected by Consultant.
.3 Basis of Design: James Hardie Cement Siding

2.4 Panels

.1 Fibre Cement Panels: Panels made from fibre reinforced cement board, free from asbestos fibres; in accordance with ASTM C1186, Type A, Grade II; classified as non-combustible in accordance with ASTM E136; and having flame spread index of 0 and smoke developed index 5 in accordance with ASTM E84, having the following characteristics:

.1 Size: as indicated on Drawings.

.2 Factory Finish: factory applied finish as selected by Consultant.
.3 Basis of Design: James Hardie Cement Panels

2.5 Trim

.1 Fibre Cement Trim: Trim made from fibre reinforced cement board, free from asbestos fibres; in accordance with ASTM C1186, Type A, Grade II; classified as non-combustible in accordance with ULC S114; and having flame spread index of 25 or less in accordance with ULC S102, having the following characteristics:

.1 Width: 88.9 mm or as indicated on Drawings.
.2 Texture: to match Siding.
.3 Factory Finish: Prefinished acrylic in colour as selected by Consultant.

2.6 Accessories

.1 Z Bars: Fabricated from minimum 1.21 mm (0.047") base metal thickness galvanized steel to ASTM A653/A653M, Grade 230 with Z275 (G90) coating; finish material visible after assembly of wall system to match siding.

.2 Vertical Z bars: Fabricated from minimum 1.21 mm (0.047") base metal thickness galvanized steel to ASTM A653/A653M, Grade 230 with Z275 (G90) coating; finish as selected by Consultant.

.3 Siding Accessories: Provide starter strips, edge trim, corner cap, perforated soffit boards and other items as recommended by siding manufacturer for building configuration, and as follows:

.1 Provide accessories made from same material as adjacent siding, unless otherwise indicated.
.2 Provide accessories matching color and texture of adjacent siding, unless otherwise indicated.

.4 Flashing: Provide pre-finished, galvanized sheet steel flashing and trims in accordance with Section 07 62 00, at window and door heads and where indicated.

.5 Elastomeric Joint Sealant: Two - part multi-component sealant joint sealant in accordance with Section 07 92 00.

.6 Fasteners:

.1 Fastening to Wood: Ribbed, hot-dipped galvanized bugle head screws of sufficient length to penetrate a minimum of 25 mm into substrate as per manufacturer's recommendations.
.2 Fastening to Metal: Ribbed, hot-dipped galvanized bugle head screws of sufficient length to penetrate a minimum of 6 mm or 3 - screw threads into substrate.

2.7 Finishing

.1 Finish factory primed panels with a minimum of one coat of high quality 100 percent acrylic exterior grade paint within 180 days of installation. Follow paint manufacturer's written product recommendation and written application instructions.

.2 Factory Primer: Provide factory applied universal primer.

.1 Primer: Factory primed by James Hardie.

.2 Topcoat: Refer to Section 09 91 00 and Exterior Finish Schedule.

.3 Factory Finish: Refer to Exterior Finish Schedule.

.1 Product: ColorPlus Technology by James Hardie.
.2 Definition: Factory applied finish; defined as a finish applied in the same facility and company that manufactures the siding substrate.
.3 Process:

.1 Factory applied finish by fiber cement manufacturer in a controlled environment within the fiber cement manufacturer's own facility utilizing a multi-coat, heat cured finish within one manufacturing process.
.2 Each finish color must have documented color match to delta E of 0.5 or better between product lines, manufacturing lots or production runs as measured by photospectrometer and verified by third party.

.4 Protection: Factory applied finish protection such as plastic laminate that is removed once siding is installed
.5 Accessories: Complete finishing system includes pre-packaged touch-up kit provided by fiber cement manufacturer. Provide quantities as recommended by manufacturer.

.4 Factory Finish Color for Trim, Soffit and Siding Colors (James Hardie): As indicated on Drawings.

3. EXECUTION

3.1 Examination

.1 Examine substrates for compliance with requirements for installation tolerances and other conditions affecting performance of siding.

.2 Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 Preparation

.1 Clean substrates of projections and substances detrimental to application.

.2 Install girts and other secondary structural siding support members and anchorage according to reviewed shop drawings and manufacturer’s written instructions.

3.3 Installation

.1 Install panels in accordance with CGSB 34.4 and manufacturer's written installation instructions applicable to products and applications.

.2 Allow 3 mm gap between trim and panel. Seal gap with joint sealant.

.3 Finish exposed cut ends with matching colour and paint.

.4 INSTALLATION - HARDIEPLANK HZ5 LAP SIDING AND ARTISAN HZ5 LAP SIDING

.1 Install materials in strict accordance with manufacturer's installation instructions.
.2 Starting: Install a minimum 1/4 inch (6 mm) thick lath starter strip at the bottom course of the wall. Apply planks horizontally with minimum 1-1/4 inches (32 mm) wide laps at the top. The bottom edge of the first plank overlaps the starter strip.
.3 Allow minimum vertical clearance between the edge of siding and any other material in strict accordance with the manufacturer's installation instructions.
.4 Align vertical joints of the planks over framing members.
.5 Maintain clearance between siding and adjacent finished grade.
.6 Locate splices at least one stud cavity away from window and door openings.
.7 Wind Resistance: Where a specified level of wind resistance is required Hardieplank lap siding is installed to framing members and secured with fasteners described in Table No. 2 in National Evaluation Service Report No. NER-405.
.8 Locate splices at least 12 inches (305 mm) away from window and door openings.

.5 INSTALLATION - HARDIEPANEL HZ5 VERTICAL SIDING

.1 Install materials in strict accordance with manufacturer's installation instructions.
.2 Block framing between studs where HardiePanel siding horizontal joints occur.
.3 Install metal Z flashing and provide a 1/4 inch (6 mm) gap at horizontal panel joints.

.4 Place fasteners no closer than 3/8 inch (9.5 mm) from panel edges and 2 inches (51 mm) from panel corners.
.5 Allow minimum vertical clearance between the edge of siding and any other material in strict accordance with the manufacturer's installation instructions.
.6 Maintain clearance between siding and adjacent finished grade.
.7 Specific framing and fastener requirements refer to Tables 2 and 3 in National Evaluation Service Report No. NER-405.
.8 Factory Finish Touch Up: Apply touch up paint to cut edges in accordance with manufacturer's printed instructions.
.9 Touch-up nicks, scrapes, and nail heads in pre-finished siding using the manufacturer's touch-up kit pen.
.10 Touch-up of nails shall be performed after application, but before plastic protection wrap is removed to prevent spotting of touch-up finish.
.11 Use touch-up paint sparingly. If large areas require touch-up, replace the damaged area with new pre-finished siding. Match touch up color to siding color through use of manufacturer's branded touch-up kits.

.6 INSTALLATION - HARDIE HZ5 SHINGLESIDE CLADDING

.1 Install materials in strict accordance with manufacturer's installation instructions.
.2 Substrate: Install a minimum 7/16 inch (11 mm) thick OSB wall sheathing or equivalent braced walls complying with applicable building codes.
.3 Starting: Install a minimum 1/4 inch (6 mm) thick lath starter strip at the bottom course of the wall.
.4 Maintain clearance between siding and adjacent finished grade.
.5 Apply starter course of 10 inches (254 mm) shingles or 9-1/2 inches (241 mm) lap siding overlapping the starter strip.
.6 Apply subsequent courses horizontally with a minimum 10 inch overlap at the top and a minimum 2 inch (51 mm) side lap. The bottom edge of the first two courses overlaps the starter strip.
.7 Fasten between 1/2 inch (13 mm) and 1 inch (25 mm) in from the side edge and between 8-1/2 inches (216 mm) and 9 inches (229 mm) up from the shingle bottom edge.
.8 Allow minimum vertical clearance between the edge of siding and any other material in strict accordance with the manufacturer's installation instructions.
.9 Ensure vertical joints of overlapping shingle course do not align.
.10 Wind Resistance: Where a specified level of wind resistance is required, Hardie Shingle siding is installed to substrate and secured with a minimum two fasteners described in Table No. 6, 7 and 8 in National Evaluation Service Report No. NER-405.

.7 INSTALLATION - HARDIETRIM HZ5 BOARDS

.1 Install materials in strict accordance with manufacturer's installation instructions. Install flashing around all wall openings.
.2 Fasten through trim into structural framing or code complying sheathing. Fasteners must penetrate minimum 3/4 inch (19 mm) or full thickness of sheathing. Additional fasteners may be required to ensure adequate security.
.3 Place fasteners no closer than 3/4 inch (19 mm) and no further than 2 inches (51 mm) from side edge of trim board and no closer than 1 inch (25 mm) from end. Fasten maximum 16 inches (406 mm) on center.
.4 Maintain clearance between trim and adjacent finished grade.
.5 Trim inside corner with a single board trim both side of corner.
.6 Outside Corner Board Attach Trim on both sides of corner with 16 gage corrosion resistant finish nail 1/2 inch (13 mm) from edge spaced 16 inches (406 mm) apart, weather cut each end spaced minimum 12 inches (305 mm) apart.
.7 Allow 1/8 inch gap between trim and siding.
.8 Seal gap with high quality, paint-able caulk.
.9 Shim frieze board as required to align with corner trim..
.10 Fasten through overlapping boards. Do not nail between lap joints.
.11 Overlay siding with single board of outside corner board then align second corner board to outside edge of first corner board. Do not fasten HardieTrim boards to HardieTrim boards.
.12 Shim frieze board as required to align with corner trim.

.13 Install HardieTrim Fascia boards to rafter tails or to sub fascia.

3.4 Adjusting and Cleaning

.1 Remove damaged, improperly installed, or otherwise defective siding materials and replace with new materials complying with specified requirements.

.2 Clean finished surfaces according to siding manufacturer's written instructions and maintain in a clean condition during construction.

END OF SECTION

1. GENERAL

1.1 Summary

.1 This Section includes sheet metal flashing and trim in the following categories:

.1 Roof drainage systems.
.2 Exposed trim and reglets.
.3 Metal flashing.
.4 Roof expansion joint covers.

.2 Sheet metal flashings specified in this section are intended to protect membranes from accelerated deterioration arising from exposure to the elements, and to protect the building from migration of moisture into vulnerable assemblies by diverting water to the exterior or other drainage plane.

.3 Membrane through wall and roof flashings are identified in affected related sections and specified in Section 07 25 13 – Air and Vapour Membranes.

1.2 Reference Standards

.1 Aluminum Association (AA):

.1 Designation System for Aluminum Finishes,
.2 Guidelines for Aluminum Sheet Metal Work in Building Construction,

.2 American National Standards Institute (ANSI):

.1 ANSI H35.1/35.1M, American National Standard Alloy and Temper Designation Systems for Aluminum, 2017

.3 American Society for Testing Materials (ASTM International):

.1 ASTM B32, Standard Specification for Solder Metal
.2 ASTM B209/B209M, Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate
.3 ASTM A653/A653M, Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process
.4 ASTM A792/A792M, Standard Specification for Steel Sheet, 55% Aluminum Zinc Alloy Coated by the Hot-Dip Process

.4 Canadian General Standards Board (CGSB):

.1 CAN/CGSB 37.5, Cutback Asphalt Plastic Cement
.2 CAN/CGSB 37.29, Rubber/Asphalt Sealing Compound

.5 Other Reference Standards:

.1 The Roofing Contractors Association of British Columbia (RCABC): Roofing Practices Manual.
.2 Sheet Metal and Air Conditioning Contractors' National Association (SMACNA): Architectural Sheet Metal Manual

1.3 Administrative Requirements

.1 Coordination: Coordinate work of this Section with interfacing and adjoining Work for proper sequencing of each installation and to provide positive weather resistance, durability of the work, and protection of materials and finishes, and as follows:

.1 Coordinate work of this section with the requirements of other technical sections forming part of Division 07 – Thermal and Moisture Protection, for specific requirements for supply of prefinished sheet metal flashing materials to other sections of the work as follows:

.1 Supply prefinished sheet metal flashings required for the project, regardless of sheet metal thickness and colour.

.2 Provide prefinished sheet metal flashings to installing trades, tension levelled, and guillotine sheared to length ready for brake forming, fabrication and installation by installing trades.

.3 Coordinate with installing trades during bid period and obtain the quantity, thickness and colour of flashing materials required under their respective scopes of work and include in the preformed metal wall and cladding Bid Price.

.4 Subcontractor will be entitled to additional payment from installing trades where quantity, thickness or colour of prefinished metal flashings is different than indicated during the bid period, as follows:

- Additional payment will not be considered as a change to the Contract where difference is the result of an estimating error on the part of the installing trade, and payment shall be coordinated with the Construction Manager.
- Additional payment will be considered as a change to the Contract where difference is a result of a change in design or material directed by the Consultant and will be administered in accordance with the requirements of the General Conditions of Contract.

.5 Requirements of this portion of the scope of work do not apply to extruded aluminum or other pre-manufactured flashing materials normally supplied by installing trades (i.e.: extruded aluminum curtain wall flashing and sills, preformed roof penetrations, non-prefinished sheet metal products).

.6 Subcontractor responsible for supply of metal wall and soffit cladding will only be responsible for fabrication and installation of flashings relating to their scope of work.

1.4 Submittals

.1 Action Submittals: Provide the following submittals before starting any work of this Section:

.1 Product Data: Submit product data including manufacturer's material and finish data, installation instructions, and general recommendations for each specified flashing material and fabricated product.

1.5 Quality Assurance

.1 Qualifications: Provide proof of qualifications when requested by Consultant:

.1 Installer: Engage an experienced installer having a minimum of five (5) years experience who has completed projects similar in material, design, and extent to that indicated for this Project and with a record of successful in-service performance.

2. PRODUCTS

1.1 Manufacturers

.1 Acceptable Products Manufacturers: Subject to compliance with requirements specified in this Section, use any of the following listed manufacturers' products, provided required product data and shop drawing are submitted before starting any work of this Section:

.2 Substitutions: Additional manufacturers offering similar products to Acceptable Products Manufacturers listed above may be incorporated into the work provided they meet the performance requirements established by the named products and provided they submit requests for substitution.

2.2 Metal Flashing Materials

.1 Zinc Galvanized Sheet Steel Flashing: Tension levelled, Commercial Steel (CS) designation, Type A, Grade 230 in accordance with ASTM A653/A653M, and as follows:

.1 Thickness: Minimum 0.45 mm base metal thickness, and as modified by Article 2.5 below.
.2 Galvanizing Designation: Z275 applied evenly to both sides.
.3 Metal Flashing (MF#):

.1 Surface Texture: Smooth.
.2 Finish: Prefinished colour selected as indicated on Drawings using Valspar Colorite HMP Ceramic.

.2 Aluminum/Zinc Galvanized Sheet Steel Cladding: Tension levelled, Commercial Steel (CS) designation, Type A, Grade 275 in accordance with ASTM A792/A792M, and as follows:

.1 Thickness: Minimum 0.45 mm base metal thickness, and as modified by Item 2.5 below.
.2 Galvanizing Designation: AZM180, applied evenly to both sides.
.3 Acceptable Products:

.1 Dofasco Inc., Galvalume.

.3 Formed Aluminum Flashings: Tension levelled, aluminum sheet in accordance with ASTM B209/B209M and ANSI H35.1/H35.1M alloy designation 3003H14, and as follows:

.1 Thickness: Minimum 1.0 mm, and as modified by Item 2.5 below.
.2 Aluminum Flashing: Prefinished colour as indicated on Drawings using Duranar coatings.

2.3 Miscellaneous Materials and Accessories

.1 Solder: ASTM B32, Grade Sn50, used with rosin flux for galvanized steel flashings.

.2 Fasteners: Same metal as sheet metal flashing or other non-corrosive metal as recommended by sheet metal manufacturer. Match finish of exposed heads with material being fastened.

.3 Dielectric separator: Bituminous paint: Isolation coating between aluminum and other metallic materials, concrete and preservative treated wood, acid, and alkali resistant asphaltic paint in accordance with MPI Architectural Painting Specification Manual Approved Product listing MPI #35.

.4 Asphalt Mastic: Solvent type asphalt mastic, nominally free of sulphur and containing no asbestos fibres, compounded for 0.40 mm dry film thickness per coat.

.5 Mastic Sealant: CAN/CGSB 37.29 polyisobutylene; non-hardening, non-skinning, non-drying, non-migrating sealant.

.6 Elastomeric Sealant: Generic type recommended by sheet metal manufacturer and fabricator of components being sealed and complying with requirements for joint sealants as specified in Section 07 92 00 – Joint Sealants.

.7 Epoxy Seam Sealer: Two component, non-corrosive, aluminum seam cementing compound, recommended by aluminum manufacturer for exterior and interior non-moving joints, including riveted joints.

.8 Adhesives: Type recommended by flashing sheet metal manufacturer for waterproof and weather resistant seaming and adhesive application of flashing sheet metal.

.9 Slip Sheet: CSA A123.3, No. 15 perforated asphalt saturated felts.

.10 Flexible Flashing: Polyethylene faced bituminous membrane materials compatible with permeable air and vapour membraneChoose an item. not less than 0.5 mm thick and be compatible with all other materials being used and mastic compatible and approved for use with the flashing material.

.11 Metal Accessories: Provide sheet metal clips, straps, anchoring devices, and similar accessory units as required for installation of Work, matching or compatible with material being installed; non-corrosive; size and thickness required for performance.

.12 Roofing Cement: In conformance with CAN/CGSB 37.5, asbestos free, asphalt based.

2.4 Fabrication, General

.1 Fabricate sheet metal building flashings and trim in accordance with the recommendations of SMACNA's Architectural Sheet Metal Manual that apply to the design, dimensions, metal, and other characteristics as required.

.2 Fabricate sheet metal roofing flashings in accordance with the recommendations of the RCABC, and as follows:

.1 Make flashing of prefinished metal for cap flashings, for all flashings adjacent to roofing at roof edges and area dividers and where exposed to view from ground.
.2 Make flashing for other roof locations, of plain galvanized metal.

.3 Fabricate sheet metal flashing and trim to fit substrates and result in waterproof and weather resistant performance once installed.

.4 Verify shapes and dimensions of surfaces being covered before fabricating sheet metal.

.5 Form exposed sheet metal Work that is without excessive oil canning, buckling, and tool marks and that is true to line and levels indicated, with exposed edges folded back to form hems.

.6 Seams:

.1 Fabricate non-moving seams in sheet metal with flat lock seams.
.2 Tin edges being seamed, form seams, and solder.

.7 Seams: Fabricate non-moving seams in aluminum with flat-lock seams. Form seams and seal with epoxy seam sealer. Rivet joints for additional strength.

.8 Expansion Provisions:

.1 Space movement joints at 3050 mm o/c with no joints allowed within 610 mm of corners or intersections
.2 Form expansion joints of intermeshing hooked flanges, not less than 25 mm deep, filled with mastic sealant concealed within joints where lapped or bayonet type expansion provisions cannot be used or are not sufficiently weatherproof and waterproof.

.9 Sealed Joints: Form non-expansion, but movable, joints in metal to accommodate elastomeric sealant in accordance with SMACNA standards.

.10 Separate metal from non-compatible metal or corrosive substrates by coating concealed surfaces at locations of contact with asphalt mastic or other permanent separation as recommended by manufacturer.

.11 Conceal fasteners and expansion provisions where possible. Exposed fasteners are not allowed on faces of sheet metal exposed to public view.

.12 Fabricate cleats and attachment devices from same material as sheet metal component being anchored or from compatible, non-corrosive metal recommended by sheet metal manufacturer, and as follows:

.1 Size as recommended by SMACNA manual or sheet metal manufacturer for application but not less than thickness of metal being secured.

2.5 Sheet Metal Fabrications

.1 Fabricate sheet metal items in thickness or weight needed in accordance with performance requirements but not less than that listed below for each application and metal.

.2 Exposed Trim and Fasciae: Fabricate from the following material:

.1 Aluminum: 1.20 mm thick.
.2 Stainless Steel: 0.50 mm thick.
.3 Terne Coated Stainless Steel: 0.50 mm thick.
.4 Galvanized Steel: 0.70 mm thick.
.5 Aluminum Zinc Alloy Coated Steel: 0.70 mm thick.
.6 Coil Coated Galvanized Steel: 0.70 mm thick.

.3 Copings: Fabricate from the following material:

.1 Aluminum: 1.20 mm thick.
.2 Stainless Steel: 0.65 mm thick.
.3 Terne Coated Stainless Steel: 0.65 mm thick.
.4 Galvanized Steel: 0.0396 inch (1.0 mm) thick.
.5 Aluminum Zinc Alloy Coated Steel: 0.0396 inch (1.0 mm) thick.
.6 Coil Coated Galvanized Steel: 0.0396 inch (1.0 mm) thick.

.4 Base Flashing: Fabricate from the following material:

.1 Aluminum: 1.00 mm thick.
.2 Galvanized Steel: 0.70 mm thick.
.3 Aluminum Zinc Alloy Coated Steel: 0.70 mm thick.
.4 Coil Coated Galvanized Steel: 0.70 mm thick.

.5 Counter Flashing: Fabricate from the following material:

.1 Aluminum: 0.80 mm thick.
.2 Galvanized Steel: 0.55 mm thick.
.3 Aluminum Zinc Alloy Coated Steel: 0.55 mm thick.
.4 Coil Coated Galvanized Steel: 0.55 mm thick.

.6 Flashing Receivers: Fabricate from the following material:

.1 Aluminum: 0.80 mm thick.
.2 Galvanized Steel: 0.55 mm thick.
.3 Aluminum Zinc Alloy Coated Steel: 0.55 mm thick.
.4 Coil Coated Galvanized Steel: 0.55 mm thick.

.7 Drip Edges: Fabricate from the following material:

.1 Aluminum: 0.80 mm thick.
.2 Stainless Steel: 0.40 mm thick.
.3 Galvanized Steel: 0.55 mm thick.
.4 Aluminum Zinc Alloy Coated Steel: 0.55 mm thick.
.5 Coil Coated Galvanized Steel: 0.55 mm thick.

.8 Roof-to-Wall Expansion Joint Cover: Fabricate from the following material:

.1 Aluminum: 1.20 mm thick.
.2 Stainless Steel: 0.65 mm thick.
.3 Terne Coated Stainless Steel: 0.65 mm thick.
.4 Galvanized Steel: 0.85 mm thick.
.5 Aluminum Zinc Alloy Coated Steel: 0.85 mm thick.
.6 Coil Coated Galvanized Steel: 0.85 mm thick.

2.6 Aluminum Extrusion Fabrications

.1 Aluminum Extrusion Units: Fabricate extruded aluminum running units with formed or extruded aluminum joint covers for installation behind main members where possible. Fabricate mitred and welded corner units.

3. EXECUTION

3.1 Examination

.1 Examine substrates and conditions under which sheet metal flashing and trim are being installed and verify that Work may properly commence. Do not proceed with installation until unsatisfactory conditions have been corrected.

3.2 Installation

.1 Install sheet metal flashing and trim in accordance with performance requirements, manufacturer's installation instructions, and SMACNA's Architectural Sheet Metal Manual.

.2 Anchor units of Work securely in place by methods indicated, providing for thermal expansion of metal units; conceal fasteners where possible, and set units true to line and level as indicated.

.3 Install Work with laps, joints, and seams that will be permanently watertight and weatherproof.

.4 Install exposed sheet metal Work that is without excessive oil canning, buckling, and tool marks and that is true to line and levels indicated, with exposed edges folded back to form hems. Install sheet metal flashing and trim to fit substrates and to result in waterproof and weather resistant performance.

.5 Verify shapes and dimensions of surfaces being covered before fabricating sheet metal.

.6 Roof Edge Flashings: Secure metal flashings at roof edges at a maximum of 610 mm o/c.

.7 Expansion Provisions:

.1 Provide for thermal expansion of exposed sheet metal Work.
.2 Space movement joints at maximum of 3050 mm with no joints allowed within 610 mm of corner or intersection.
.3 Form expansion joints of intermeshing hooked flanges, not less than 25 mm deep, filled with mastic sealant (concealed within joints) where lapped or bayonet type expansion provisions in work cannot be used or are not sufficiently weatherproof and waterproof.

.8 Soldered Joints:

.1 Clean surfaces being soldered, removing oils and foreign matter.
.2 Pre-tin edges of sheets being soldered to a width of 38 mm, except where pre-tinned surface would show in finished Work.
.3 Do not solder the following metals:

.1 Aluminum.
.2 Coil coated galvanized steel sheet.
.3 Terne coated stainless steel.

.4 Do not use torches for soldering.
.5 Heat surfaces to receive solder and flow solder into joint.
.6 Fill joint completely.
.7 Completely remove flux and spatter from exposed surfaces.

.9 Sealed Joints:

.1 Form non-expansion, but movable, joints in metal to accommodate elastomeric sealant in accordance with SMACNA standards.
.2 Fill joint with sealant and form metal to completely conceal sealant.
.3 Use joint adhesive for non-moving joints specified not being soldered.

.10 Seams:

.1 Fabricate non-moving seams in sheet metal with flat lock seams.
.2 Tin edges being seamed, form seams, and solder.

.11 Seams: Fabricate non-moving seams in aluminum with flat lock seams. Form seams and seal with epoxy seam sealer. Rivet joints for additional strength.

.12 Separations:

.1 Separate metal from non-compatible metal or corrosive substrates by coating concealed surfaces, at locations of contact, with asphalt mastic or other permanent separation as recommended by manufacturer.
.2 Underlayment: Install a slip sheet of red rosin paper and a course of polyethylene underlayment where installing stainless steel or aluminum directly on cementitious or wood substrates.
.3 Bed flanges of Work in a thick coat of roofing cement where required for waterproof performance.

.13 Counter Flashings:

.1 Coordinate installation of counter flashings with installation of assemblies being protected by counter flashing. Install counter flashings in reglets or receivers.
.2 Secure in a waterproof manner by means of snap-in installation and sealant, lead wedges and sealant, interlocking folded seam, or blind rivets and sealant.
.3 Lap counter flashing joints a minimum of 50 mm and bed with sealant.

.14 Roof Drainage System:

.1 Install drainage items fabricated from sheet metal, with straps, adhesives, and anchors recommended by SMACNA's Manual or the Item manufacturer, to drain roof in the most efficient manner.
.2 Coordinate roof drain flashing installation with roof drainage system installation.
.3 Coordinate flashing and sheet metal items for steep sloped roofs with roofing installation.

.15 Overhead Piping Safety Pans: Suspend pans from pipe and install drain line to plumbing waste or drain line.

.16 Equipment Support Flashing:

.1 Coordinate equipment support flashing installation with roofing and equipment installation.
.2 Weld or seal flashing to equipment support member.

.17 Roof Penetration Flashing:

.1 Coordinate roof penetration flashing installation with roofing and installation of items penetrating roof.

.2 Turn lead flashing down inside vent piping, being careful not to block vent piping with flashing.
.3 Seal and clamp flashing to pipes penetrating roof, other than lead flashing on vent piping.

.18 Splash Pans:

.1 Install where downspouts discharge on low sloped roofs.
.2 Set in roof cement or sealant compatible with roofing membrane.

.19 Install continuous gutter screens on gutters with non-corrosive fasteners, arranged as hinged units to swing open for cleaning gutters.

3.3 Closeout Activities

.1 Cleaning: Clean exposed metal surfaces, removing substances that might cause corrosion of metal or deterioration of finishes.

.2 Protecting: Provide final protection and maintain conditions that ensure sheet metal flashing and trim Work during construction is without damage or deterioration other than natural weathering at the time of Substantial Performance.

END OF SECTION

1. GENERAL

1.1 Summary

.1 This Section includes requirements for design, supply, and installation, and inspection of static penetrations, membranes and joint firestop systems using materials, or a combination of materials required to preserve the integrity and to prevent the passage of fire and smoke in assemblies having a Fire-Resistance Rating in accordance with the requirements of the Building Code.

.2 Firestop systems are required at the following locations having a Fire-Resistance Rating:

.1 Penetrations through horizontal assemblies requiring protected openings including empty openings and openings that contain penetrating components.
.2 Penetrations through vertical assemblies including empty openings and openings that contain penetrating components.
.3 Membrane penetrations in wall assemblies where items penetrate only one side of the barrier.
.4 Joints in assemblies that allow for independent movement between assembly components.
.5 Perimeter of horizontal assemblies having a Fire-Resistance Rating and exterior wall assemblies.
.6 Joints, through penetrations and membrane penetrations in assemblies intended to limit, restrict, or retard the circulation of smoke.
.7 Firestopping systems forming a part of a dynamic building joint are described in Section 07 95 00 – Expansion Control.

.3 This Section includes requirements for Fire-Resistance Rated systems requiring Engineering Judgements in accordance with Section 07 05 53 – Fire and Smoke Assembly Identification, and that account for the following restrictions:

.1 Products that have not been tested in a system or that are not capable of obtaining an Engineering Judgement will not be acceptable for use on this Project.
.2 Materials having only a ULC or cUL label will not be acceptable for use on this Project, unless supporting documentation is provided indicating its use in a ULC Rated Assembly Listing for Firestop Systems and Components of an Engineering Judgement specific to the installation conditions of the project.

.4 This Section includes requirements for installers that have completed a recognized firestopping installation education program, that can demonstrate knowledge for the selection and installation of firestop systems, obtain Engineering Judgements as necessary for the Project, and that have an integrated approach to controlling material selection and management of the installation process as required by this Specification and the Authority Having Jurisdiction.

.5 This Section includes requirements for third-party verification of installed firestop system components forming a part of the work of this Section by an inspection agency that employs personnel who are qualified to perform this work in accordance a recognized training program acceptable to the Consultant and Authority Having Jurisdiction.

1.2 Reference Standards

.1 ASTM International (ASTM):

.1 ASTM E90, Standard Test Method for Laboratory Measurement of Airborne Sound Transmission Loss of Building Partitions and Element
.2 ASTM E2174, Standard Practice for On-Site Inspection of Installed Firestop Systems
.3 ASTM E2307, Standard Test Method for Determining Fire Resistance of Perimeter Fire Barrier Systems Using Intermediate-Scale, Multi-story Test Apparatus
.4 ASTM E2393, Standard Practice for On-Site Inspection of Installed Fire Resistive Joint Systems and Perimeter Fire Barriers

.2 International Firestop Council (IFC):

.1 Recommended IFC Guidelines for Evaluating Firestop Systems in Engineering Judgments
.2 Recommended IFC Guidelines for Evaluating Firestop Systems in Engineering Judgements: Perimeter Fire Barrier Systems
.3 Recommended IFC Guidelines for Evaluating Firestop Systems in Engineering Judgments on Fire Resistant Duct Enclosure Systems for Ventilation Ducts

.3 Firestop Contractors International Association (FCIA):

.1 FCIA Manual of Practice

.4 Underwriters Laboratories of Canada (ULC):

.1 CAN/ULC S101, Standard Methods of Fire Endurance Tests of Building Construction and Materials
.2 CAN/ULC S102, Standard Method of Test for Surface Burning Characteristics of Building Materials and Assemblies
.3 CAN/ULC S114, Standard Method of Test for Determination of Non-Combustibility in Building Materials
.4 CAN/ULC S115, Standard Method of Fire Tests of Firestop Systems
.5 ULC Firestop Systems and Components

1.3 Definitions

.1 Additional Definitions: Additional definitions associated with work of this Section are described in Section 07 05 53 – Fire and Smoke Assembly Identification; coordinate and incorporate common work requirements specified in Section 07 05 53 – Fire and Smoke Assembly Identification with work of this Section.

.2 Fire-Resistance Rating: The time in minutes or hours that a material or assembly of materials will withstand the passage of flame and transmission of heat when exposed to fire meeting the requirements of CAN/ULC S101 or as determined by formal testing of material or assembly of materials meeting requirements of CAN/ULC S115, or an interpretation of information derived from formal testing in accordance with requirements of the Building Code and acceptable to the Authority Having Jurisdiction.

.3 Fire Separation: Assembly that acts as a barrier against the spread of fire, smoke and noxious gases resulting from combustion as defined by the Building Code and includes the following assemblies having a Fire-Resistance Rating requiring firestopping as follows:

.1 Penetration-Type firestop systems located within load bearing walls and partitions.
.2 Penetration-Type firestop systems located within non-load bearing walls and partitions.
.3 Penetration-Type located within floor assemblies.
.4 Building Perimeter-Type located between floor assemblies and exterior wall and roof construction.
.5 Penetration-Type located within roof assemblies.
.6 Construction Joint-Type and other assemblies having a Fire-Resistance Rating indicated on Drawings or Schedules.

.4 Fire Compartment: Spaces within a building that are enclosed by exterior walls or separated from other parts of the building by enclosing Fire Separations having a Fire-Resistance Rating.

.5 Firewall: Assembly that is a Fire Separation constructed from non-combustible construction subdividing a building or separating adjoining buildings to resist the spread of fire and that has a Fire-Resistance Rating, and structural stability to remain intact under fire conditions for the required fire-rated time.

.6 Smoke Barriers/Partitions: Barriers, partitions and other assemblies that are sealed to limit the spread of smoke and noxious gases as follows:

.1 Assembly Type: Construction of Smoke Barriers is identical to a minimum 1-hour Fire-Resistance Rating described above that does not require ULC Fire-Resistant Assembly Listing.
.2 Leakage Rate: Smoke Barriers must be sealed to limit the passage of smoke and noxious gases at ambient and elevated temperatures to a maximum of 25 litres/s•m² when subjected to a pressure difference of 75 Pa at 24°C and 200°C.

.7 Firestop: System consisting of a material, component or combination of materials and components used to fill gaps between Fire Separations or between Fire Separations and other assemblies or used around items that wholly or partially penetrate a Fire Separation.

.8 Membrane Penetration: An opening made through one side of an assembly having a Fire-Resistance Rating; and that is not an opening that penetrates completely through that assembly, and that a firestop system is installed to maintain the integrity of the Fire-Resistance Rating of that assembly.

.9 Qualified Supervisor or Installer: The Construction Manager's supervisor or a specialty Subcontractor that can demonstrate their skill and knowledge for the design and installation of firestop systems of similar complexity and extent required for the Project, and that can certify installation was completed in accordance with ULC Listed Assemblies submitted as a component of shop drawing Submittals.

.10 Qualified Firestop Contractor: A Subcontractor that has completed the ULC Qualified Firestop Contractor Program or other acceptable accreditation program described in this Section, and that can provide proof of continued compliance with the training and accreditation program.

1.4 Administrative Requirements

.1 Scheduling: Submit a schedule listing surfaces and components that firestopping materials and components are being applied sufficiently in advance of installation of any through penetration and perimeter containment firestop systems to allow for full coordination of adjacent assemblies, obtaining any required Engineering Judgements or Equivalent Fire Resistance Rated Assembly, and to allow for a detailed review by the Consultant, and as follows:

.1 Schedule installation of cast-in-place firestop systems, components, or devices to coincide with installation of concrete formwork or metal decking before placement of concrete.
.2 Schedule installation of drop-in type firestop systems, components, or devices after placement of concrete, and to coincide with installation of piping, conduit, or other penetrating components.
.3 Schedule installation of other firestop systems after completion of penetrating item installation, before covering or concealing of openings, joints, and penetrations.

.2 Coordination: Project coordination is essential to inform and educate all contributors involved with or affected by installation of firestopping systems, so that their role in protecting and maintaining the integrity of firestopping systems is understood, and as follows:

.1 Coordinate with other trades and verify that pipes, conduit, cable, and other items penetrating Fire-Resistance Rated assemblies are permanently installed prior to installation of firestop assemblies.
.2 Coordinate construction of openings and penetrating items and verify that firestop systems are installed according to specified requirements and as follows:
.3 Coordinate sizing of sleeves, openings, core drilled holes, or cut openings to accommodate firestop systems; diameter of sleeves or cored holes must match listed system for the device.

.4 Leave firestopping installations that will be concealed behind other construction open until Consultant and building inspector; if required by Authority Having Jurisdiction, have examined each installation.

.3 Pre-Construction Meeting: Arrange a pre-construction meeting, attended by General Contractor , Subcontractor responsible for firestopping, firestop manufacturers' representatives, subcontractors affected by work of this Section, and the Consultant to discuss the following requirements:

.1 Confirm locations, quantity, and types of firestop systems for required site Mock-Ups.
.2 Confirm extent of standard materials and systems, and identify materials and systems that will require Engineering Judgements or Equivalent Fire Resistance Rated Assemblies
.3 Confirm site conditions, coordination issues and single source installation responsibility for application of firestop systems; either by a specialty firestop Subcontractor or the by the Construction Manager where Construction Manager can show proof of qualifications required by this Section.

1.5 Submittals

.1 Provide required information where Engineering Judgements or Equivalent Fire Resistance Rated Assemblies are required to complete project installation conditions.

.2 Action Submittals: The following are required before starting any work of this Section:

.1 Product Data: Submit manufacturer's product data for materials and prefabricated devices as follows:

.1 Include manufacturer's installation instructions, descriptions of system composition and limitations of installation.
.2 Include confirmation that installed systems meet requirements of ULC or cUL firestop Systems and Components where installation fully matches listed assembly.
.3 Include copies of Equivalent Fire Resistance Rated Assembly where similar conditions as tested assemblies do not meet project installation conditions, and where installation does not require a full Engineering Judgement.
.4 Include copies of Equivalent Fire Resistance Rated Assembly or Engineering Judgements clearly indicating EFRRA and EJ identification numbers, project name, installing Subcontractor's name when no ULC or cUL system is available meeting project installation conditions.

.2 Firestop System Schedule: Submit schedule prepared by installing Subcontractor indicating locations of firestop systems as follows:

.1 Consultant's Project Number and Project Name.
.2 Installing Subcontractor's Name and Address.
.3 Listing of Manufacturers Names and Addresses for products used on the Project.
.4 Name of Construction Manager or Subcontractor's Qualified Supervisor.
.5 Manufacturers' Product Reference for each type of penetrating item and joint sealant, including:

- Listing Agency (ULC, cUL or FM) Number for each different location and assembly type.
- Designated Rating (F, T, FT, H, W or L) appropriate to the penetrations or joint condition.

.6 Types of assemblies being penetrated, listing Fire-Resistance Ratings and thickness of construction.
.7 EFRRA and EJ numbers for non-classified firestop systems.

.3 Informational Submittals: The following are required before starting any work of this Section:

.1 Material Certificates: Submit written certification prepared by firestopping manufacturer stating that products supplied to the Project comply with local regulations controlling use of volatile organic compounds (VOCs) and are non-noxious to building occupants.
.2 Installer Qualifications: Submit certificate indicating that personnel are trained and qualified to install firestopping products described in this section, issued by firestopping manufacturer.
.3 Site Quality Control Submittals: Submit manufacturers record of site observations and any recommendations or modification for site installed components to Consultant immediately following completion of manufacturer's Site Quality Control Activities.

1.6 Project Closeout Submissions

.1 Operation and Maintenance Data: Submit manufacturer's written instructions for operations and maintenance procedures of installed firestopping systems, include name of original installer and contact information.

.2 Record Documentation: Submit as-built information describing modifications to ULC or cUL listed firestopping details accepted by the Consultant, and that were necessary to account for site installation conditions.

.3 Spare Parts: Submit inventory of products and components used during construction of firestopping systems for the Project and include a listing of quantities that need to be maintained on site, and source location for purchasing maintenance materials.

1.7 Quality Assurance

.1 Regulatory Requirements: Use materials and methods of determining required thickness of application that have the full acceptance of Authority Having Jurisdiction and that are tested in accordance with ULC S115 and that form a part of a ULC or cUL listed system, Engineering Judgement or Equivalent Fire Resistance Rated Assembly.

.2 Qualifications: Provide proof of qualifications when requested by Consultant:

.1 Installer: Use a firestopping Subcontractor that has completed the ULC Qualified Firestop Contractor Program and that employs experienced applicators having experience with similar systems and complexity as required for the Project, using proper equipment in strict accordance with manufacturer's written installation instructions for tested and listed systems designs, Engineering Judgements or Equivalent Fire Resistance Rated Assemblies and as follows:
.2 Single Source Installation Responsibility: Obtain firestop systems, for each kind of penetration and construction condition required for the project from a single source of installation responsibility to the greatest extent possible.

1.8 Delivery, Storage, And Handling

.1 Delivery and Acceptance Requirements: Deliver and store materials in a dry protected area, in original undamaged sealed containers with the manufacturer's labels, application instructions, and labelling agency's labels intact.

.2 Storage and Handling Requirements: Keep materials dry until ready for use and as follows:

.1 Keep the packages of material off the ground, under cover, and away from sweating walls and other damp surfaces. Discard material that has been exposed to water before actual use.
.2 Use stock before its expiration date.

1.9 Site Conditions

.1 Installation Conditions: Install firestopping materials only when the areas in which they are scheduled are closed-in and protected from dampness.

.2 Ambient Conditions: Install firestop systems when ambient or substrate temperatures are within temperature and moisture limits permitted by firestopping system manufacturers or when substrates are not wet due to rain, frost, condensation, or other causes.

.3 Ventilation: Ventilate areas where firestop systems are being installed in accordance with manufacturer's written instructions by natural means or forced air circulation where natural means are not adequate.

2. PRODUCTS

2.1 Manufacturers

.1 Acceptable Products Manufacturers: Subject to compliance with requirements specified in this Section, use any of the following listed manufacturers' products, provided required product data and shop drawing are submitted before starting any work of this Section:

.1 Passive Fire Protection Partners ,
.2 Hilti Inc.
.3 Roxtec,
.4 Specified Technologies Inc.
.5 3M,
.6 Tremco Ltd.

.2 Substitutions: Additional manufacturers offering similar products to Acceptable Products Manufacturers listed above may be incorporated into the work provided they meet the performance requirements established by the named products and provided they submit requests for substitution.

2.2 Regulatory Requirements

.1 Fire Resistance Rated Assemblies: Materials described on the Drawings and within this Section are based on generic contributions listed in the Building Code and as follows:

.1 Fire-Resistance Ratings: Products used in assemblies having a Fire-Resistance Rating must be constructed, applied, or installed in accordance with assemblies tested and approved by agencies acceptable to the Authority Having Jurisdiction.
.2 Products: Provide systems having fire test response characteristics in accordance with requirements specified in Section 07 05 53 – Fire and Smoke Assembly Identification, and as follows:

.1 Individual products and materials containing only a testing agency mark without reference to a specific ULC or $_{C}$UL listed assembly are not acceptable.
.2 Use only materials matching the tested and listed system; do not mix materials from of different manufacturers in the same firestop system or opening that do not form a component of the tested and listed system.
.3 Single source of product and materials responsibility is not required, multiple product and material sourcing is encouraged to obtain the widest selection of tested and listed systems for the project.
.4 Products from different manufacturers are permitted; provided they are not intermixed with other manufacturers' products, to maintain maximum opportunity for installation of tested and listed systems.
.5 Use a different manufacturer that has a tested and listed system before submitting an Engineering Judgment or Equivalent Fire Resistance Rated Assembly.

.3 Limitations of Qualifications: Installation of products and materials specified in this Section require experienced installers that are certified or otherwise licensed, and who have received installation training provided by firestopping manufacturers:

.1 Willingness from a supplier or manufacturer to sell firestopping products to entities other than those qualified to perform work of this Section as specified, does not confer qualifications to the buyer of those products.
.2 Failure to provide proof of qualifications when requested by the Consultant will denote automatic rejection of any firestop system proposed for use.

2.3 Performance Requirements

.1 Design Responsibility: Design firestopping required for the Project to withstand assembly fire performance requirements described on Drawings in accordance with the Building Code, and as described in Section 07 05 53 – Fire and Smoke Assembly Identification, and as follows:

.1 Design firestop systems for empty openings and openings containing penetrating items through Fire Compartments and Firewalls.
.2 Design firestop systems that are manufactured to resist spread of fire in accordance with specified requirements, that resist passage of smoke and noxious gases, and that maintain original Fire-Resistance Rating of construction penetrated.
.3 Design firestopping at openings intended for ease of re-entry such as cables using elastomeric or flexible seals; do not use cementitious or rigid seals at these locations.
.4 Design firestopping at openings around penetrations for pipes, ductwork and other mechanical items requiring sound and vibration control using elastomeric or flexible seals; do not use cementitious or rigid seal at these locations.
.5 Design firestopping at fire damper locations so as not to restrict the expansion or contraction of the penetrating ductwork and does not interfere with the ability of the damper to drop into place and operate correctly.
.6 Design firestopping using tested assemblies to the greatest extent possible; use of Engineering Judgements and Equivalent Fire Resistance Rated Assemblies should only be submitted for review when a tested assembly is not available from any of the listed acceptable manufacturers.

.2 Firestopping Design Conditions: Following conditions apply to firestopping systems proposed for use in the Project:

.1 Smoke Barriers: Provide materials meeting the following criteria:

.1 Performance Rating: L-Rated, Ambient Temperature Only.
.2 Assembly Rating: Not Required.
.3 Nominal Joint Width: As indicated.
.4 Movement Capabilities: Compression and extension

.2 Penetrations: Provide materials meeting the following criteria:

.1 Performance Rating: F, FT or FTW-Rated applicable to assembly being penetrated.
.2 Assembly Rating: Time rating for Fire-Resistance Rating and Temperature Rise Resistance Rating applicable to assembly being penetrated.
.3 Nominal Annular Width: As indicated.
.4 Movement Capabilities: Not Required.

.3 Floor-to-Floor, Fire Resistive Expansion Joint System: Provide materials meeting the following criteria:

.1 Performance Rating: F, FT, FW or FTW-Rated applicable to assembly being penetrated.
.2 Assembly Rating: As indicated on Drawings, time rating for Fire-Resistance Rating and Water Resistance Rating applicable to assembly being sealed.
.3 Nominal Joint Width: As indicated
.4 Movement Capabilities: Compression, extension, vertical offset, and horizontal shear.

.4 Floor-to-Wall, Fire Resistive Joint System: Provide materials meeting the following criteria:

.1 Performance Rating: F, FT or FTW-Rated applicable to assembly being penetrated.
.2 Assembly Rating: Time rating for Fire-Resistance Rating and Temperature Rise Resistance Rating applicable to assembly being sealed.
.3 Nominal Joint Width: As indicated.
.4 Movement Capabilities: Compression, extension, and horizontal shear.

.5 Head-of-Wall, Fire Resistive Joint System: Provide materials meeting the following criteria:

.1 Performance Rating: F or FT-Rated applicable to assembly being penetrated.
.2 Assembly Rating: Time rating for Fire-Resistance Rating and Temperature Rise Resistance Rating applicable to assembly being sealed.
.3 Nominal Joint Width: As indicated.
.4 Movement Capabilities: Compression and extension.
.5 Refer to Section 09 21 16 – Gypsum Board Assemblies for head of wall systems installed as a component of steel stud framed partitions.

.6 Wall-to-Wall, Fire Resistive Joint System: Provide materials meeting the following criteria:

.1 Performance Rating: F or FT-Rated applicable to assembly being penetrated.
.2 Assembly Rating: Time rating for Fire-Resistance Rating and Temperature Rise Resistance Rating applicable to assembly being sealed.
.3 Nominal Joint Width: As indicated.
.4 Movement Capabilities: Compression and extension.

.3 Performance Requirements: Provide manufacturer's proprietary assemblies designed to seal penetrations through and perimeters around Fire Separation or Firewall assemblies having a Fire-Resistance Rating equal to or greater than the Fire-Resistance Rating of the Fire Separation or Firewall assemblies in accordance with REFERENCE STANDARDS and the Building Code, and as follows:

.1 Thickness and Composition of Materials: Determine thickness and composition of applied materials based on tests of assemblies identical to the assembly being protected where possible.
.2 Engineering Judgements: Determine system composition based on available engineering studies, or correspondence with the labelling agency indicating the effect that differences within Fire Separation where the assembly is protected but does not correspond exactly to a tested assembly; confirm acceptance of system by local Authority Having Jurisdiction in writing.
.3 Equivalent Fire Resistance Rated Assembly: Use the same system and material as would be required for a tested assembly with similar conditions where the assembly includes conditions that do not correspond to those included in any previously tested assembly and that do not have relevant engineering information available at the time of installation.
.4 Acoustic Ratings: Use firestop products that provide a minimum of STC 55 within sound rated assemblies.

2.4 Assemblies

.1 Systems: Provide firestop systems that are tested in accordance with ULC S115, comprised of asbestos free materials capable of maintaining an effective barrier against flame, smoke, and noxious gases, and sized for opening sizes for which they are intended based on Fire-Resistance Ratings indicated on Drawings and as follows:

.1 Penetrations: Provide firestopping to penetrations passing through fire-resistance rated wall and floor assemblies, and other locations indicated on Drawings:

.1 F-Rated Through-Penetration Firestop Systems: Provide through-penetration firestop systems that resist passage of smoke and noxious gases at ambient and elevated temperatures, with F and L ratings meeting or exceeding the fire-resistance ratings of construction being penetrated.

.2 T-Rated Through-Penetration Firestop Systems: Provide firestop systems with T ratings in addition to F ratings described above when temperature rise resistance is a performance requirement of construction being penetrated.
.3 L-Rated Through-Penetration Firestop Systems: Provide firestop systems with L ratings for assemblies requiring only ambient temperature smoke and noxious gas resistance, without additional F or T requirements.
.4 W-Rated Through-Penetration Firestop Systems: Provide firestop systems with W ratings, in addition to F, T and L ratings when site conditions require water resistance as an assembly performance requirement.

.2 Perimeter Fire Containment Systems: Provide interior perimeter fire containment systems with fire-resistance ratings in accordance with ASTM E2307.
.3 Systems Exposed to View: Provide products that after curing do not deteriorate when exposed to traffic, moisture, and physical damage and as follows:

.1 Provide moisture resistant through penetration firestop systems for piping penetrations for plumbing and wet pipe sprinkler systems, and at the floor joint of fire rated gypsum board assemblies.
.2 Provide firestop systems capable of supporting floor loads involved either by installing floor plates or by other means for floor penetrations with annular spaces exceeding 100 mm in width and exposed to possible loading and traffic.
.3 Provide firestop systems not requiring removal of insulation for penetrations involving insulated piping.
.4 Provide products with flame spread ratings of less than 25 and smoke developed ratings of less than 50 for firestopping and joint systems exposed to view in accordance with CAN/ULC S102.

.2 Compatibility: Provide firestop systems that are compatible with one another, with the substrates forming openings, and with the items penetrating firestop systems, under conditions of service and application, as demonstrated by firestopping system manufacturer based on testing and site experience, and as follows:

.1 Service Penetration Assemblies: Certified by ULC in accordance with ULC S115 and listed in ULC List of Equipment and Materials, Firestop Systems and Components.
.2 Service Penetration Firestopping Components: Certified by ULC in accordance with ULC S115 and listed in ULC List of Equipment and Materials, Firestop Systems and Components.

.3 Accessories: Provide components for each firestopping system that are needed to install fill materials and to comply with REFERENCE STANDARDS, using only components specified by firestopping system manufacturer and approved by the qualified testing and inspecting agency for firestop systems indicated. Accessories include, but are not limited to, the following items:

.1 Permanent forming, damming, and backing materials, including the following:

.1 Slag or rock wool fibre insulation.
.2 Sealants used in combination with other forming, damming, or backing materials to prevent leakage of fill materials in liquid state.
.3 Fire rated form board.
.4 Fillers for sealants.

.2 Temporary forming materials.
.3 Substrate primers.
.4 Collars.
.5 Steel sleeves.
.6 Primers: to manufacturer’s recommendation for specific material, substrate, and end use.
.7 Water (if applicable): potable, clean and free from injurious amounts of deleterious substances.
.8 Metal Firestop: Commercial galvanized steel, having minimum 260 g/m² zinc coating and minimum nominal metal core thickness 0.9 mm.

.9 Moulded Flute Inserts for Steel Decks: Preformed, single piece moulded mineral fibre flute inserts sized for steel deck profiles; designed for placement at top of fire rated wall assemblies and having spray-applied intumescent fire and smoke seal as follows:

.1 Basis-of-Design Products: Hilti CP777 Speed Plugs with Hilti CFS-SP WB Firestop Joint Spray.
.2 Refer to Section 09 21 16 – Gypsum Board Assemblies for head of wall systems installed as a component of steel stud framed partitions.

.10 Labels: Self-adhering labels described in Section 07 05 53 – Fire and Smoke Assembly Identification.

2.5 Fill Materials

.1 Provide only fill materials that are referred to in listed assemblies of the referenced testing and inspecting agencies as fill, void, or cavity materials.

.2 Cast-in-Place Firestopping Devices: Factory assembled devices for use in cast-in-place concrete floors and consisting of an outer metallic sleeve lined with an intumescent strip, a radial extended flange attached to one end of the sleeve for fastening to concrete formwork, and a neoprene gasket.

.3 Latex or Acrylic Sealants: Single-component latex or acrylic formulations that do not re-emulsify after cure during exposure to moisture.

.4 Firestopping Devices: Factory assembled collars formed from galvanized steel and lined with intumescent material sized to fit specific diameter of penetrating item.

.5 Cable Penetration Devices:

.1 Pre-manufactured intumescent blocks, as follows:

.1 Hilti CFS-BL Intumescent Blocks.
.2 Roxtec Intumescent Blocks.

.2 Pre-manufactured sleeves, consisting of an adjustable core, and as follows:

.1 Hilti CP 653 Speed Sleeves.
.2 Specified Technologies EZ-Path Fire Rated Pathway.

.3 Pre-manufactured cable management system, consisting of a system of intumescent inserts and adjustable cores, and as follows:

.1 Hilti CFS-T SB or SS Cable Transit System.
.2 Roxtec Preformed Firestopping Systems.

.6 Intumescent Composite Sheets: Rigid panels consisting of aluminum foil faced elastomeric sheet bonded to galvanized steel sheet.

.7 Intumescent Putties: Non-hardening dielectric, water resistant putties containing no solvents, inorganic fibres, or silicone compounds.

.8 Intumescent Spray Foam: Expanding spray-in-place intumescent foam sealant.

.9 Intumescent Wrap Strips: Single component intumescent elastomeric sheets with aluminum foil on one side.

.10 Mortars: Pre-packaged, dry mixes consisting of a blend of inorganic binders, hydraulic cement, fillers, and lightweight aggregate formulated for mixing with water at Project site to form a non-shrinking, homogeneous mortar.

.11 Pillows/Bags: Reusable, heat expanding pillows/bags consisting of glass fibre cloth cases filled with a combination of mineral fibre, water insoluble expansion agents and fire-retardant additives.

.12 Silicone Foams: Multi-component, silicone based liquid elastomers that, when mixed, expand and cure in place to produce a flexible, non-shrinking foam.

.13 Silicone Sealants: Moisture curing, single component, silicone based, neutral curing elastomeric sealants of grade indicated below:

.1 Grade for Horizontal Surfaces: Pourable (self-levelling) formulation for openings in floors and other horizontal surfaces.
.2 Grade for Vertical Surfaces: non-sag formulation for openings in vertical and other surfaces.

2.6 Mixing

.1 Mix components and materials in accordance with firestopping system manufacturer's written instructions for accurate proportioning of materials, water (if required), type of mixing equipment, selection of mixer speeds, mixing containers, mixing time, and other items or procedures needed to produce products of uniform quality with optimum performance characteristics for application indicated.

3. EXECUTION

3.1 Examination

.1 Examine surfaces, components, materials to receive firestopping material; report any conditions that would detrimentally affect the application of the material or the proper firestopping of the system.

.1 Verify service lines are in place, tested and approved where penetration sealants or caulking are required.
.2 Verify that proper blocking, framing (using non-combustible materials) are properly installed and prepared to receive firestopping.
.3 Notify Consultant in writing of any deficiencies affecting the proper performance of the firestopping, do not proceed until deficiencies are corrected.

.2 Commence Work when conditions of surfaces and the working conditions are suitable.

3.2 Preparation

.1 Prepare surfaces in contact with firestopping materials in accordance with manufacturer's instructions.

.1 Maintain insulation around pipes and ducts penetrating Fire Separation without interruption to vapour barrier where applicable.
.2 Mask where necessary to avoid spillage and over coating onto adjoining surfaces; remove stains on adjacent surfaces.

.2 Provide and maintain masking, drop cloths and polyethylene coverings for such surfaces to protect them during installation operations where adjacent finished floors, walls and similar surfaces are exposed.

.3 Provide complete enclosures and human protective devices when installing or mixing hazardous materials.

.4 Surfaces shall be free of oil, grease, dirt, loose paint, mill scale or any other matter that could impair bond, including paint.

.5 Prime surfaces when required by manufacturer's written instructions.

.6 Make provisions for natural ventilation during and after application of firestopping, sealant or caulking; circulate interior air by use of temporary circulators or exhaust fans in enclosed areas or areas lacking openings for natural ventilation.

3.3 Application

.1 Apply firestopping materials in strict accordance with manufacturer's written instructions, and ULC approved tested assemblies and details submitted for Consultant's acceptance.

.2 Apply firestopping materials/systems to maintain the Fire Separations in the project as indicated on Drawings; apply firestop materials to partitions enclosing Fire Compartments to top, bottom, and sides.

.3 Seal holes or voids made by through penetrations, poke through termination devices, and unpenetrated openings or joints and verify continuity and integrity of Fire Separation are maintained.

.4 Provide temporary forming as required and remove forming only after materials have gained sufficient strength and after initial curing.

.5 Tool or trowel exposed surfaces to a neat finish.

.6 Remove excess compound promptly as work progresses and upon completion.

.7 Place self-sticking labels on a permanent surface adjacent to firestopping installation.

3.4 Site Quality Control

.1 Owner's Testing and Inspection: Owner will engage a third-party testing and inspection agency as described in Section 07 05 53 – Fire and Smoke Assembly Identification, and as follows:

.1 Owner's testing and inspection for quality control does not replace Subcontractor's required Quality Assurance Program; Subcontractor will remain responsible for correct installation that is in conformance with listed assemblies submitted and reviewed by the Consultant.
.2 Firestop inspections for penetrating systems will be conducted in accordance with ASTM E2174.
.3 Firestop inspections for joint systems will be conducted in accordance with ASTM E2393.

.2 Manufacturer's Site Services: Coordinate with manufacturer's qualified technical site representative to review and report on installed firestopping components:

.1 Submit report confirming that firestopping Products and installation details meet manufacturer's tested assembly requirements or Engineering Judgements.
.2 Indicate any modifications required by site conditions and confirm that modifications do not alter the stated performance of installed firestopping Products.
.3 Subcontractor will remain responsible for correct installation that is in conformance with listed assemblies submitted as directed by and reviewed by the Consultant.

3.5 Closeout Activities

.1 Cleaning: Clean off excess fill materials and sealants adjacent to openings and joints as work progresses; use methods and cleaning materials approved by manufacturers of firestopping products and or assemblies in which penetrations, openings, gaps, and joints occur.

.2 Protection: Protect firestopping during and after curing period from contact with contaminating substances; Subcontractor is responsible for making appropriate repairs, Construction Manager will charge appropriate trades responsible for contributing to damages.

3.6 System Schedule

.1 Drawings indicate basic firestop details only and indicate performance expectations only, Subcontractor is responsible for submitting manufacturer's standard design for products supplied to the Project and include modifications to firestop systems required to meet site installation conditions, obtaining EFRRA and EJ numbers when site conditions differ from manufacturer's standard details.

END OF SECTION

1. GENERAL

1.1 Summary

.1 This Section includes requirements for joint sealant products, backings, and other related materials that are compatible with one another and with joint substrates under conditions of service and application, as demonstrated by sealant manufacturer's testing and site experience and includes for the application types and other applications specified by reference to this Section.

1.2 Related Requirements

.1 Other sections of the specifications requiring sealants refer to this section, coordinate requirements of referencing sections.

1.3 Reference Standards

.1 American Society for Testing and Materials (ASTM International):

.1 ASTM C834, Standard Specification for Latex Sealants
.2 ASTM C919, Standard Practice for Use of Sealants in Acoustical Applications
.3 ASTM C920, Standard Specification for Elastomeric Joint Sealants
.4 ASTM C1193, Standard Guide for Use of Joint Sealants
.5 ASTM C1247, Standard Test Method for Durability of Sealants Exposed to Continuous Immersion in Liquids
.6 ASTM C1248, Standard Test Method for Staining of Porous Substrate by Joint Sealants
.7 ASTM C1330, Standard Specification for Cylindrical Sealant Backing for Use with Cold Liquid Applied Sealants
.8 ASTM D2240, Standard Test Method for Rubber Property - Durometer Hardness
.9 ASTM E90, Standard Test Method for Laboratory Measurement of Airborne Sound Transmission Loss of Building Partitions and Elements

.2 Canadian General Standards Board (CGSB):

.1 CAN/CGSB 19.24, Multicomponent, Chemical Curing, Sealing Compound

1.4 Submittals

.1 Action Submittals: Provide the following submittals before starting any work of this Section:

.1 Product Data: Submit product data for each joint sealant product indicated.
.2 Samples for Verification: Submit samples for each type and colour of joint sealant required, with joint sealants in 13 mm wide joints formed between two 150 mm long strips of material matching the appearance of exposed surfaces adjacent to joint sealants for Consultant's verification of selection.

.2 Informational Submittals: Provide the following submittals when requested by the Consultant:

.1 Certificates: Submit product certificates for each type of joint sealant and accessory, signed by product manufacturer certifying that materials used are appropriate for applications that they were used.

1.5 Quality Assurance

.1 Qualifications: Provide proof of qualifications when requested by Consultant:

.1 Manufacturer: Obtain each type of joint sealant through one source from a single manufacturer.

.2 Installer: Employ installers who are experienced with the use and application of materials specified in this Section, having experience with projects of a similar extent and complexity, and that are approved or licensed for installation of elastomeric sealants by manufacturer if required for warranty conditions.

1.6 site Conditions

.1 Proceed with installation of joint sealants only when the following conditions are met:

.1 Ambient and substrate temperature conditions are within limits permitted by joint sealant manufacturer.
.2 Joint substrates are dry.
.3 Joint widths are within tolerances of those permitted by joint sealant manufacturer for applications indicated.
.4 Substrates are free from contaminants capable of interfering with adhesion.

2. PRODUCTS

2.1 Manufacturers

.1 Acceptable Products Manufacturers: Subject to compliance with requirements specified in this Section, use any of the following listed manufacturers' products in accordance with, provided required product data and shop drawing are submitted before starting any work of this Section:

.1 BASF Corporation Construction Systems
.2 Chemtron Manufacturing Ltd.
.3 C.R. Laurence of Canada
.4 Dow Corning Canada Inc.
.5 GE, Momentive Performance Materials Inc.
.6 Pecora Corporation
.7 Sika Canada Inc.
.8 Tremco Ltd.

.2 Substitutions: Additional manufacturers offering similar products to Acceptable Products Manufacturers listed above may be incorporated into the work provided they meet the performance requirements established by the named products and provided they submit requests for substitution.

2.2 Performance requirements

.1 Exterior Building Envelope Sealants: Provide elastomeric joint sealant products for exterior applications that establish and maintain watertight and airtight continuous joint seals without staining or deteriorating joint substrates or adjacent materials.

.2 Interior Building Envelope Sealants: Provide joint sealant products for interior applications that establish and maintain airtight and water resistant continuous joint seals without staining or deteriorating joint substrates or adjacent materials.

.3 Elastomeric Joint Sealants: Provide sealant products in accordance with ASTM C920 classifications for type, grade, class, and uses related to exposure and joint substrates and as follows:

.1 Provide products that have been tested in accordance with ASTM C1248 where elastomeric sealants are required for non-staining to porous substrate applications.
.2 Provide products that have been tested in accordance with ASTM C1247 where elastomeric sealants are required for water immersion Class 1 or 2 as referenced in ASTM C920.
.3 Provide products that have been tested and approved by the CFIA, and are labelled as Safe for Contact with Food where elastomeric sealants are required to come in repeated contact with food.

.4 Latex Joint Sealants: Provide sealant products in accordance with ASTM C834, temperature Grade to suit related exposure and joint substrates, paintable, non-sag and non-staining for general application, and acoustic seals in exposed locations.

.5 Acoustical Sealant for Concealed Joints: Provide sealant products in accordance with CAN/CGSB 19.21-M, ASTM C919 and ASTM E90 non-drying, non-hardening, non-skinning, non-staining, gun grade, synthetic-rubber sealant recommended for sealing interior concealed joints to reduce airborne sound transmission. Coordinate with Section 09 21 16 – Gypsum Board Assemblies.

2.3 Liquid Sealants

.1 Type S-1 Acrylic Sealant: Single component acrylic latex, Shore A Hardness 20, conforming to CAN/CGSB 19.17-M and ASTM C834, Type OP, Grade NF:

.1 Acceptable Products:

.1 CR Laurence, 15W.
.2 Pecora AVW-920.
.3 Tremco Tremflex 834.

.2 Type S-2 Silicone Sealant, Mould and Mildew Resistant: Silicone based, single component, Shore A Hardness 15-25, conforming to CAN/CGSB 19.13-M, Classification C-1-40-B-N and C-1-25-B-N; and ASTM C920, Type S, Grade NS, Class25, use NT:

.1 Acceptable Products:

.1 BASF OmniPlus.
.2 CRL 33S.
.3 Dowsil 786.
.4 Momentive GE SCS 1700 Sanitary.
.5 Pecora 898NST.
.6 Tremco Tremsil 200.

.3 Type S-3 Silicone Sealant: Exterior Weatherproofing Sealant: Silicone based, single component, low modulus, neutral cure, Shore A Hardness 15-25, conforming to CAN/CGSB 19.13-M, Classification C-1-40-B-N and C-1-25-B-N, and ASTM C 920, Type S, Grade NS, Class 25, use NT, M, G, A and O, colour as selected by Consultant from Standard Range:

.1 Acceptable Products:

.1 Momentive GE SCS 2700 Silpruf LM.
.2 Dowsil 790.
.3 Pecora 890NST.
.4 SikaSil WS-290.
.5 Tremco Spectrum 13.

.4 Type S-5, Interior Acoustical Sealant: Mastic type, non-skinning, non-hardening, single component synthetic rubber sealant, conforming to CAN/CGSB 19.21-M and ASTM C919 and ASTM E90:

.1 Acceptable Products:

.1 Chemtron Metaseal.
.2 Pecora BA-98.
.3 Tremco Acoustic Sealant.

.5 Type S-6, Air Seal Sealant: Silicone based, single component, Shore A hardness 15 – 25, conforming to CGSB 19-GP-13M, classification C-1-40-B-N and C-1-25-B-N and ASTM C920, Type S, Grade NS, Class 25. Use NT, M, G, A and O:

.1 Acceptable Products:

.1 Dowsil 790.

.2 Momentive GE SCS 2700 Silpruf LM.
.3 Pecora AVB Silicone.
.4 Sikasil WS-290.
.5 Tremco Spectrum 1.

.6 Type S-7, Exterior Wall Sealant: Two-component Sealant: Chemical curing urethane, non-sag, Shore A Hardness 20-35, conforming to CAN/CGSB 19.24-M, Type 2, Class B, and ASTM C920, Type S, Grade NS, Class 25, use NT, M, and A:

.1 Acceptable Products:

.1 BASF MasterSseal NP2.
.2 Pecora Dynatred.
.3 Sikaflex 2c NS EZ Mix.
.4 Tremco Dymeric.
.5 Tremco Vulkem 227.

.7 Type S-8, Horizontal Joint Sealant: Two component, self levelling, polyurethane elastomeric conforming to CAN/CGSB 19.24M, Type 1, Class A, and ASTM C920, Type M, Grade P, Class 50, use T, M, and O:

.1 Acceptable Products:

.1 Sikaflex 2c SL EZ Mix.
.2 Tremco THC-901.
.3 BASF MasterSeal SL 2.

.8 Type S-9, Fuel Resistant Sealant: Two component, polyurethane elastomeric, chemical cured, conforming to CGSB 19-GP-13M and ASTM C920, Type M, Grade P, Class 25, use T, M, A, O, and 1 (Class 2):

.1 Acceptable Products:

.1 BASF MasterSeal CR 125.
.2 Sikaflex-2c NS EX Mix.
.3 Pecora Dynatred.
.4 Tremco Vulkem 116/445SSL.

.9 Type S-10, Polyurethane Sealant: Single component, non-sag, for general construction, Shore A Hardness 15+, conforming to CAN/CGSB 19.13-M, Type 2, Classification MCG-2-25-A-N and ASTM C920, Type S, Grade NS, Class 25, Use NT, M, and A:

.1 Acceptable Products:

.1 BASF MasterSeal NP 1.
.2 Chemtron Multiflex.
.3 Sikaflex 1a.
.4 Tremco Dymonic or Vulkem 116.

.10 Type S-11, Saw-Cut Sealants: Multi-component, quick-setting, self-levelling conforming to ASTM D2240 Shore A Hardness 65 75; and ASTM C920, Type M, Grade O, Class 25, Use T:

.1 Acceptable Products:

.1 MBCC Group, MasterSeal CR 190.
.2 Tremco THC-901
.3 Sika Canada, Loadflex-524 EZ.

.11 Type S-12, Control Joint Sealant: Two component, solvent free, flexible epoxy-urethane, load bearing, conforming to ASTM D2240 Shore A Hardness 65-75; and ASTM C920, Type M, Grade P, Class 50, Use T:

.1 Acceptable Products:

.1 Master Builders, Masterseal CR190.
.2 Sika Canada, Loadflex-524 EZ.

2.4 Preformed Sealants

.1 Preformed Silicone Sealant System: Manufacturer's standard system consisting of pre-cured low modulus silicone extrusion, in sizes to fit joint widths indicated, combined with a neutral curing silicone sealant for bonding extrusions to substrates:

.1 Acceptable Products:

.1 Dow Corning Corporation; Dowsil 123 Silicone Seal.
.2 Momentive GE US1100 UltraSpan.
.3 Tremco; Spectrem Ez Seal.

2.5 Sealant Backing

.1 Provide sealant backings of material and type that are non-staining, compatible with joint substrates, sealants, primers, and other joint fillers, and are approved for applications indicated by sealant manufacturer based on site experience and laboratory testing.

.2 Backing Rods: Meeting requirements of ASTM C1330, Type C (closed cell material with a surface skin); Type O (open cell material); or Type B (bi-cellular material with a surface skin) and as follows:

.1 Use backing rod materials specifically recommended by joint sealer manufacturer for type of installation and materials being used.
.2 Use any of the preceding types, as approved in writing by joint sealant manufacturer for joint application indicated.
.3 Size and density to control sealant depth and otherwise contribute to producing optimum sealant performance.
.4 Non-adhering to sealant, to maintain two sided adhesion across joint.

.3 Bond Breaker Tape: Self adhesive polyethylene tape or other plastic tape recommended by sealant manufacturer for preventing sealant from adhering to rigid, inflexible joint filler materials or joint surfaces at back of joint where three-sided adhesion will result in sealant failure.

2.6 Accessories

.1 Primer: Material recommended by joint sealant manufacturer where required for adhesion of sealant to joint substrates indicated, as determined from pre-construction joint sealant substrate tests and site tests.

.2 Cleaners for Nonporous Surfaces: Chemical cleaners acceptable to manufacturers of sealants and sealant’s backing materials, free of oily residues or other substances capable of staining or harming joint substrates and adjacent nonporous surfaces in any way and formulated to promote optimum adhesion of sealants to joint substrates.

.3 Masking Tape: Non-staining, non-absorbent material compatible with joint sealants and surfaces adjacent to joints.

3. EXECUTION

3.1 EXAMINATION

.1 Examine joints indicated to receive joint sealants for compliance with requirements for joint configuration, installation tolerances, and other conditions affecting joint sealant performance.

.2 Proceed with installation after unsatisfactory conditions have been corrected.

.3 Pre-Construction Site Adhesion Testing: Site test adhesive adhesion to joint substrates before installing sealants as follows:

.1 Locate test joints where indicated on Drawings or, if not indicated, as directed by Consultant.
.2 Conduct site tests for each application indicated below:

.1 Each type of elastomeric sealant and joint substrate indicated.
.2 Each type of non-elastomeric sealant and joint substrate indicated.

.3 Notify Consultant seven (7) days in advance of dates and times when test joints will be installed.
.4 Arrange for tests to take place with joint sealant manufacturer's technical representative present in accordance with ASTM C1193, and as follows:

.1 Test Method: X1.1 Method A, Site Applied Sealant Joint Hand Pull Tab.

.5 Verify adhesion to each substrate separately for joints with dissimilar substrates; extend cut along one side, verifying adhesion to opposite side; repeat procedure for opposite side.
.6 Report whether sealant in joint connected to pulled out portion failed to adhere to joint substrates or tore cohesively:

.1 Include data on pull distance used to test each type of product and joint substrate.
.2 Retest until satisfactory adhesion is obtained for sealants that fail adhesively.

.7 Evaluation of Pre-construction Site Adhesion Test Results:

.1 Sealants not evidencing adhesive failure from testing, in absence of other indications of non-compliance with requirements, will be considered satisfactory.
.2 Do not use sealants that fail to adhere to joint substrates during testing.

3.2 PREPARATION

.1 Clean out joints immediately before installing joint sealants to comply with joint sealant manufacturer's written instructions and the following requirements:

.1 Remove all foreign material from joint substrates that could interfere with adhesion of joint sealant, including dust, paints (except for permanent, protective coatings tested and approved for sealant adhesion and compatibility by sealant manufacturer), old joint sealants, oil, grease, waterproofing, water repellents, water, surface dirt, and frost.
.2 Clean all porous joint substrate surfaces by brushing, grinding, blast cleaning, mechanical abrading, or a combination of these methods to produce a clean, sound substrate capable of developing optimum bond with joint sealants.
.3 Remove loose particles remaining after cleaning operations above by vacuuming or blowing out joints with oil free compressed air.
.4 Remove laitance and form release agents from concrete.
.5 Clean nonporous surfaces with chemical cleaners or other means that do not stain, harm substrates, or leave residues capable of interfering with adhesion of joint sealants.
.6 Porous joint substrates include, but are not limited to, concrete, masonry, and unglazed surfaces of ceramic tile.
.7 Nonporous joint substrates include, but are not limited to, metal, glass, porcelain enamel, and glazed surfaces of ceramic tile.

.2 Prime joint substrates as recommended in writing by joint sealant manufacturer, based on pre-construction joint sealant substrate tests or prior experience:

.1 Apply primer to comply with joint sealant manufacturer's written instructions.
.2 Confine primers to areas of joint sealant bond; do not allow spillage or migration onto adjoining surfaces.

.3 Install backing rods at exterior locations when temperature is falling, to prevent possible out-gassing bubbles from cut or nicked surfaces of backing materials and potential for bubble formation in applied sealants.

.4 Install bond breaker tapes in joints that are too shallow to allow for installation of backing rods.

.5 Use masking tape where required to prevent contact of sealant with adjoining surfaces that otherwise would be permanently stained or damaged by such contact or by cleaning methods required to remove sealant smears; remove tape immediately after tooling without disturbing joint seal.

3.3 Installation of Joint Sealants

.1 Comply with joint sealant manufacturer's written installation instructions for products and applications indicated unless more stringent requirements apply.

.2 Comply with recommendations in ASTM C1193 for use of joint sealants as applicable to materials, applications, and conditions indicated.

.3 Acoustical Sealant Application Standard: Comply with recommendations in ASTM C919 for use of joint sealants in acoustical applications as applicable to materials, applications, and conditions indicated.

.4 Install sealant backings of type indicated to support sealants during application and at position required to produce cross sectional shapes and depths of installed sealants relative to joint widths that allow optimum sealant movement capability.

.1 Do not leave gaps between ends of sealant backings.
.2 Do not stretch, twist, puncture, or tear sealant backings.
.3 Remove absorbent sealant backings that have become wet before sealant application and replace them with dry materials.

.5 Install bond breaker tape behind sealants where sealant backings are not used between sealants and backs of moving joints.

.6 Install sealants at the same time backings are installed, and as follows:

.1 Place sealants so they directly contact and fully wet joint substrates.
.2 Completely fill recesses in each joint configuration.
.3 Produce uniform, cross sectional shapes and depths relative to joint widths that allow optimum sealant movement capability.
.4 Install sealant in such a matter as to avoid creating a concave or recessed joint.

.7 Sealants: Immediately after sealant application and before skinning or curing begins, tool non-sag sealants to form smooth, uniform beads, to eliminate air pockets; and to ensure contact and adhesion of sealant with sides of joint, and as follows:

.1 Remove excess sealant from surfaces adjacent to joints.
.2 Use tooling agents and profiles that are approved in writing by sealant manufacturer and that do not discolour sealants or adjacent surfaces in accordance with the figures listed in ASTM C1193, and as follows:

.1 Provide flush joint in accordance with Figure 8B.
.2 Use masking tape to protect surfaces adjacent to recessed tooled joints.

.8 Install preformed tapes in accordance with manufacturer's written instructions.

.9 Install preformed silicone sealant system as follows:

.1 Apply masking tape to each side of joint, outside of area covered by sealant system.

.2 Apply silicone sealant to each side of joint to produce a bead of size complying with preformed silicone sealant system manufacturer's written instructions and covering a bonding area of not less than 10 mm.
.3 Hold edge of sealant bead 6 mm inside masking tape.
.4 Press silicone extrusion into sealant to wet extrusion and substrate within 10 minutes of sealant application.
.5 Use a roller to apply consistent pressure and ensure uniform contact between sealant and both extrusion and substrate.
.6 Complete installation of sealant system in horizontal joints before installing in vertical joints.
.7 Lap vertical joints over horizontal joints.
.8 Cut silicone extrusion with a razor knife at ends of joints.

3.4 Closeout activities

.1 Cleaning: Clean off excess sealant or sealant smears adjacent to joints as the Work progresses by methods and with cleaning materials approved in writing by manufacturers of joint sealants and of products in which joints occur.

.2 Protecting:

.1 Protect joint sealants during and after curing period from contact with contaminating substances and from damage resulting from construction operations or other causes so sealants are without deterioration or damage at time of Substantial Performance.
.2 Cut out and remove damaged or deteriorated joint sealants immediately so installations with repaired areas are indistinguishable from original work if, despite protection measures, damage or deterioration occurs.

3.5 Joint Sealant Schedule

.1 Where no specified type of sealant is shown or specified choose one of the sealants specified in this Section applicable to that intended application, and consistent with manufacturer's recommendations.

.2 Use acrylic sealant Type S-1 only on the interior and only in situations where little or no movement can occur.

.3 Use mould and mildew resistant silicone sealant Type S-2 for non-moving joints in washrooms and kitchens, and for stainless steel corner guards; do not use on floors.

.4 Use silicone general construction sealant Type S-3 or polyurethane sealant Type S-7 and S-10 for all joints, interior and exterior, where no other specific sealant type specified; do not use on horizontal traffic joints or where immersed in water.

.5 Use acoustical sealant Type S-5 for interior applications only where they will be fully concealed and only where no constant or consistent air pressure difference will exist across the joint.

.6 Use air seal sealant Type S-6 for exterior walls only where constant or consistent air pressure difference will exist across the joint.

.7 Use two component sealant Type S-7 as follows:

.1 For exterior vertical joints where large movement is anticipated, not for continuous water immersion.
.2 For edge joint sealant at slab edges at walls, columns, interior shaft walls and grade beams.
.3 In primed penetration element surfaces other than concrete, for mechanical and electrical service penetrations in concrete foundation walls and cored holes in existing tunnel. Ensure compatible material at tunnel penetrations.

.8 Use two component sealant Type S-8 for horizontal joint sealant of plaza, floors and decks, exterior areas only, subject to pedestrian and vehicular traffic.

.9 Use two component polysulphide fuel resistant sealant Type S-9 in pavement around diesel generators, and wherever fuel oils may be present.

.10 Use two component sealant type S-11 for saw-cuts in slabs on grade and horizontal joint sealant of plaza, floors and decks, interior areas only.

.11 Use two component flexible epoxy sealant type S-12 for joint sealant where floor finished densified concrete or concrete with hardener are specified.

.12 In addition, seal the following joints:

.1 Exterior joints for vertical surfaces and horizontal non-traffic surfaces:

.1 Construction joints in cast-in-place concrete.
.2 Control and expansion joints in unit masonry.
.3 Joints between metal panels.
.4 Joints between different materials listed above.
.5 Perimeter joints between materials listed above and frames of doors, windows, and louvers.
.6 Control and expansion joints in ceilings and other overhead surfaces.
.7 Other joints as indicated.

.2 Exterior joints for horizontal traffic surfaces:

.1 Isolation and contraction joints in cast-in-place concrete slabs.
.2 Tile control and expansion joints.
.3 Joints between different materials listed above.
.4 Other joints as indicated.

.3 Interior joints in the following vertical surfaces and horizontal non-traffic surfaces:

.1 Control and expansion joints on exposed interior surfaces of exterior walls.
.2 Perimeter joints of exterior openings where indicated.
.3 Tile control and expansion joints.
.4 Vertical joints on exposed surfaces of interior unit masonry concrete, walls, and partitions.
.5 Perimeter joints between interior wall surfaces and frames of interior doors, windows, and elevator entrances.
.6 Joints between walls and millwork, and walls and backsplashes.
.7 Joints between plumbing fixtures and adjoining walls, floors, and counters.
.8 Seal joints in floor and wall penetrations around service and fixture penetrations.
.9 Seal joints at heads of non-load-bearing block walls on both sides, as indicated on drawings.
.10 Other joints as indicated.

.4 Interior joints in the following horizontal traffic surfaces:

.1 Isolation joints in cast-in-place concrete slabs.
.2 Control and expansion joints in tile flooring.
.3 Other joints as indicated.

END OF SECTION

1. GENERAL

1.1 Summary

.1 This Section includes requirements for supply and installation of the following:

.1 Steel doors and steel door frames.
.2 Fire rated door and frame assemblies.

1.2 Reference Standards

.1 American National Standards Institute (ANSI):

.1 ANSI/SDI A250.8, Specifications for Standard Steel Doors and Frames
.2 ANSI/SDI A250.11, Recommended Erection Instructions for Steel Frames

.2 American Society for Testing Materials (ASTM International):

.1 ASTM A653/A653M, Standard Specification for Steel Sheet, Zinc Coated (Galvanized) or Zinc Iron Alloy Coated (Galvannealed) by the Hot Dip Process
.2 ASTM A879/A879M, Standard Specification for Steel Sheet, Zinc Coated by the Electrolytic Process for Applications Requiring Designation of the Coating Mass on Each Surface
.3 ASTM A924/A924M, Standard Specification for General Requirements for Sheet Steel, Metallic Coated by the Hot Dip Process

.3 Canadian General Standards Board (CGSB):

.1 CAN/CGSB 1.132, Zinc Chromate Primer, Low Moisture Sensitivity
.2 CAN/CGSB 41-GP-19Ma, Rigid Vinyl Extrusions for Windows and Doors
.3 CAN/CGSB 82.5, Insulated Steel Doors

.4 Canadian Standards Association (CSA Group):

.1 CSA W59, Welded Steel Construction (Metal Arc Welding)

.5 Canadian Steel Door Manufacturers Association (CSDMA):

.1 Recommended Specifications for Commercial Steel Door and Frames Product,
.2 Recommended Selection and Usage Guide for Commercial Steel Door and Frame Products,
.3 Recommended Dimensional Standards for Commercial Steel Doors and Frames,
.4 Canadian Fire Labelling Guide for Commercial Steel Door and Frame Products,

.6 National Fire Protection Association (NFPA):

.1 NFPA 80-, Standard for Fire Doors and Other Opening Protectives
.2 NFPA 252, Standard Methods of Fire Tests of Door Assemblies

.7 Underwriters Laboratories Canada (ULC):

.1 CAN/ULC S104, Standard Method for Fire Tests of Door Assemblies
.2 CAN/ULC S105, Standard Specification for Fire Door Frames Meeting the Performance Required by CAN/ULC S104
.3 CAN/ULC S106, Standard Method for Fire Tests of Window and Glass Block Assemblies
.4 CAN/ULC S701.1, Standard for Thermal Insulation, Polystyrene Boards

.8 Intertek Testing Services/Warnock Hersey (WH):

.1 Fire Rating Services, Building Materials and Equipment, Listings

1.3 Definitions

.1 Base Metal Thickness: Thickness dimensions are minimums as defined in referenced ASTM standards for both uncoated steel sheet and the uncoated base metal of metallic coated steel sheets.

.2 Opening Sizes: Standard metric door sizes indicated on Drawings are considered nominal dimensions, measured from frame rabbet width and height, with allowances for nominal clearances between head, jamb, and door bottom in accordance with CSDMA Recommended Dimensional Standards for Commercial Steel Doors and Frames.

1.4 Administration Requirements

.1 Coordination: Coordinate throat dimensions based on actual material used for wall construction assemblies; modifications arising from substitute materials may affect throat clearance required for actual construction.

1.5 Submittals

.1 Action Submittals: Provide the following submittals before starting any work of this Section:

.1 Product Data: Submit product data for each type of door and frame indicated, include door designation, type, level and model, material description, core description, construction details, label compliance, fire resistance ratings, and finishes.

.2 Shop Drawings: Submit shop drawings indicating the following:

.1 Elevations of each door design.
.2 Details of doors including vertical and horizontal edge details.
.3 Frame details for each frame type including dimensioned profiles.
.4 Details and locations of reinforcement and preparations for hardware.
.5 Details of each different wall opening condition.
.6 Details of anchorages, accessories, joints, and connections.
.7 Coordination of glazing frames and stops with glass and glazing requirements.
.8 Reference door types to door schedule; indicate door numbers related to Drawings and Door Schedule.

.2 Informational Submittals: Provide the following submittals when requested by the Consultant:

.1 Source Quality Control Submittals: Submit information on zinc coating treatment and primer spot treatment, including instructions for surface treatment before site painting and any restrictions or special coating requirements.

.2 Certificates: Submit the following certificates or letters of compliance:

.1 Oversize Compliance: Submit oversize construction evidence indicating compliance with fire labelling for door and frame assemblies required to be fire protection rated and exceeding size limitations of labelled assemblies.

.2 Radiation Protection Compliance: Submit evidence of compliance for radiation protection assemblies in accordance with the requirements of the Cancer Agency, the provincial Occupational Health and Safety, Radiation Safety and Protection Branch and National Council on Radiation Protection and Measurement.

1.6 Quality Assurance

.1 Manufacturer: Obtain hollow metal doors and frames from single source of supply and from a single manufacturer, and as follows:

.1 Fabricate work of this Section to meet the requirements of the Canadian Steel Door and Frame Manufacturer's Association, Manufacturing Specification for Doors and Frames as a minimum, and as further modified in this section.
.2 Fabricator shall be a member in good standing of the Canadian Steel Door and Frame Manufacturer's Association.

.2 Supplier: Obtain hollow metal doors and frames from single source of supply and from a single manufacturer.

.3 Installer: Use installers who are experienced with the installation of hollow metal doors and frames of similar complexity and extent to that required for the Project.

.4 Testing Agencies: Provide doors produced under label service program of a testing agency acceptable to Authorities Having Jurisdiction, and as follows:

.1 Steel Fire Rated Doors and Frames: Labelled and listed by an organization accredited by Standards Council of Canada for ratings specified or indicated.
.2 Provide fire labelled frame products for those openings requiring fire protection ratings, as scheduled:

.1 List by nationally recognized agency having factory inspection service and construct as detailed in Follow-up Service Procedures/Factory Inspection Manuals issued by listing agency to individual manufacturers.
.2 Fabricate all rated doors, frames and screens to labelling authority standard.

.3 Affix appropriate label to each opening requiring a labelling requirement as listed in Door, Frame and Hardware Schedule on Drawings, and as follows:

.1 At standard size openings requiring fire endurance rating.

1.7 Delivery, Storage, And Handling

.1 Delivery and Acceptance Requirements: Deliver doors and frames to project site; provide protection during transit and site storage to prevent distortion or indentation, and any additional protection required to prevent damage to finish of doors and frames and as follows:

.1 Inspect doors and frames on delivery for damage and notify shipper and supplier if damage is found.
.2 Minor damages may be repaired provided refinished items match new work and are acceptable to the Consultant.
.3 Remove and replace damaged items that cannot be repaired as directed by the Consultant, at no additional cost to the Owner.

.2 Storage and Handling Requirements: Store doors and frames at building site under cover and protected from moisture, blocked off the ground and in a manner to prevent sagging, bowing, or twisting using wood blocking and as follows:

.1 Remove wet wrapping materials immediately upon delivery.
.2 Provide vented shelters to prevent humidity conditions that could damage door and frame finish.
.3 Provide space between stacked doors to permit air circulation.

1.8 Site Conditions

.1 Site Measurements: Verify actual dimensions of openings by site measurements before fabrication and indicate measurements on shop drawings; coordinate fabrication schedule with construction progress to avoid delaying the Work.

.2 Established Measurements: Establish dimensions and proceed with fabricating doors and frames without site measurements where site measurements cannot be made without delaying the Work; coordinate construction to ensure that actual site dimensions correspond to established dimensions.

2. PRODUCTS

2.1 Materials

.1 Steel Sheet:

.1 Exterior Doors and Frames and Interior High Humidity Areas: Metallic coated steel sheets in accordance with ASTM A924/M924; coated to meet requirements of ASTM A653/A653M, Commercial Steel (CS), Type B, ZF120 galvannealed; stretcher levelled standard of flatness where used for face sheets.

.2 Interior Doors and Frames (Normal Humidity): Electrolytic zinc coated steel sheets in accordance with ASTM A879/A879M, Commercial Steel (CS), Class B coating; mill phosphatized; suitable for unexposed applications; stretcher levelled standard of flatness.

.3 Metallic coated steel sheets in accordance with ASTM A924/M924; coated to meet requirements of ASTM A653/A653M, Commercial Steel (CS), Type B, ZF75 galvannealed; suitable for unexposed applications; stretcher levelled standard of flatness.

.4 Stainless steel: type 316L , finish as selected by Consultant; 12 ga for frames; 14 ga for doors.

.2 Door Cores:

.1 Exterior Doors: Polystyrene Rigid extruded, closed cell insulation, fire retardant treated meeting the requirements of ULC S701.1, Type 4, minimum thermal resistance RSI 0.8/25 mm thickness.

.2 Interior Doors: Honeycomb structural small cell; 25 mm maximum, kraft paper honeycomb; minimum weight 36 kg/ream; minimum density 16.5 kg/m3; sanded to required thickness.

.3 Adhesives:

.1 Core Adhesive: Heat resistant, single component, polyurethane reactive (water) hot melt, thermoset adhesive.

.4 Touch-Up Primer: Rust inhibitive primer meeting CAN/CGSB 1.132, touch up zinc coatings using shop applied primer; grey or red coloured primer, clear primer not acceptable; provide additional primer for site touch-up to repair damaged zinc and shop applied coatings.

.5 Accessories:

.1 Glazing Stops:

.1 Glass mouldings: Formed steel having 1.00 mm metal core thickness, screw fixed or weld fixe at the choice of Subcontractor.

.2 Accurately fit and butt at corners glazing trim and stops; located on secure side of door, or interior of room window frame.

.2 Floor anchors, channel spreaders, nominal 1.60 mm tee anchors, 1.19 mm wall stud anchors, and as follows:

.1 Hot dipped zinc coated for exterior locations.

.2 Wipe coat galvanized for interior locations.

.3 Corrugated, galvanized tee anchors or heavy gauge galvanized wire ties for masonry bond.

.4 Drill stud anchors for wire tie to studs.

.5 Lag bolts, shields and bushing for existing or concrete openings.

.6 Provide anchors appropriate to installation conditions.

.3 Sealant: Refer to Section 07 92 00 – Joint Sealants.
.4 Glazing: Refer to Section 08 80 00 – Glazing.
.5 Exterior Top Caps: Rigid polyvinylchloride (PVC) extrusion in accordance with CAN/CGSB 41-GP-19Ma.
.6 Door Silencers (Bumpers or Mutes): Manufacturer's standard black or grey neoprene silencers; three silencers on strike jambs of single door frames; two silencers on heads of double door frames; stick on bumpers are not acceptable.

2.2 Door Fabrication

.1 Fabricate steel doors rigid, neat in appearance, and free from defects including warp and buckle; 45 mm thickness of types and sizes indicated in Door, Frame and Hardware Schedule on Drawings, and as follows:

.1 Door faces of all steel doors shall be fabricated without visible seams, free of scale, pitting, coil brakes, buckles, and waves.
.2 Form edges true and straight with minimum radius suitable for thickness of steel used.
.3 Bevel lock and hinge edges 3 mm in 50 mm; confirm requirement with builder's hardware or door swing that could dictate a different bevel.
.4 Top and bottom of doors shall be provided with inverted, recessed, nominal 1.60 mm steel end channels, welded to each face sheet at 150 mm o/c.
.5 Equip exterior doors with factory installed flush PVC top caps.
.6 Equip fire labelled exterior doors with factory installed flush steel top caps.
.7 Equip top and bottom of interior doors with nominal 1.60 mm continuous flush steel non-removable end caps welded securely in place.
.8 Provide fire labelled doors for those openings requiring fire protection ratings, as indicated in Door, Frame and Hardware Schedule on Drawings.
.9 Fabricate doors with the following clearances:

.1 Clearance between door and frame and between meeting edges of doors swinging in pairs shall not exceed 3 mm
.2 Clearance between the bottom of door and floor shall not exceed 19 mm or as required to accommodate specified hardware
.3 Clearance between bottom of door and a raised non-combustible sill in accordance with NFPA 80.
.4 Clearance between bottom of door and nominal surface of combustible floor coverings in accordance with NFPA 80.

.2 Exterior Doors: Flush, lock seam construction, insulated doors fabricated in accordance with CAN/CGSB 82.5, and as follows:

.1 Face Sheets: Minimum 1.60 mm base steel sheet thickness.
.2 Insulation Stiffened Core: Insulated and sound deadened with polystyrene core laminated under pressure to each face sheet.
.3 Longitudinal edges mechanically interlocked, continuously wire welded and smoothed.

.3 Fire Rated Doors: Flush, lock seam construction, hollow steel doors fabricated in accordance with CAN/ULC S104 and NFPA 80, and as follows:

.1 Face sheets: Minimum nominal 1.60 mm base steel sheet thickness.
.2 Stiffened and sound deadened with honeycomb core laminated under pressure to each face sheet and stiffened, insulated and sound deadened with manufacturer's proprietary Temperature Rise Limited (TRL) core material.
.3 Longitudinal edges mechanically interlocked, continuously wire welded and smoothed.
.4 Equip pairs of fire labelled doors with minimum 2.74 mm steel surface mounted flat bar astragal, welded to door face; plug welded on face and stitch welded to butt edge of door.
.5 Labelled by Underwriters Laboratories of Canada, ITS/Warnock Hersey, or other testing laboratory approved by the authority having jurisdiction.

2.3 Panel Fabrication

.1 Fabricate panels from the same materials, construction and finished in the same manner as doors as specified above in this Section.

2.4 Frame Fabrication

.1 Fabricate door frames with mitred corners of frames and weld continuously along inside of frame profile, or lap and weld concealed corner plates, making exposed faces flush, mitres tight, filled, and finished smooth, and as follows:

.1 Knockdown (KD) frames are not acceptable and will be rejected.
.2 Jambs, heads, mullions, sills, and centre rails shall be straight and uniform throughout their lengths.
.3 Factory assembled frame product shall be square, free of defects, warps, or buckles.
.4 Accurately cope joints at mullions, transom bars, sills, or centre rails, butted and tightly fitted, with faces securely welded, matching corner joint faces.
.5 Fabricate frames in sections for site splicing where required due to site access, or when shipping limitations dictate smaller assemblies, and as follows:

.1 Provide 2.74 mm splice plates for site spliced jambs, heads and sills, securely welded into one section, extending 50 mm minimum each side of splice joint.
.2 Provide 2.74 mm splice plates for site splices at closed sections (mullions or centre rails) securely welded to the abutting member; extend 100 mm minimum into closed sections when assembled.
.3 Site splice joints shall be welded, filled and ground to present a smooth uniform surface after assembly is complete.

.6 Provide two (2) temporary steel jamb spreaders welded to the base of the jambs or mullions to maintain proper alignment during shipping and handling; remove spreaders before anchoring frame to floor.
.7 Prepare door opening for single stud door silencers, three (3) for single door openings, and two (2) for double door openings, shipped installed, coordinate with painter for removal and reinstallation after finish painting.
.8 Provide fire labelled frames for those openings requiring fire protection ratings, as indicated in Door, Frame and Hardware Schedule on Drawings.

.2 Frames:

.1 Interior Frames: 1.60 mm minimum for single doors; 50 mm face standard frame profile, throat and frame width to suit wall construction.
.2 Exterior Frames: 1.98 mm minimum, with 50 mm face standard frame profile, throat, and frame width to suit wall construction.

2.5 Hardware Preparation

.1 Prepare doors in coordination with hardware schedule in Section 08 71 00 – Door Hardware and templates provided by the hardware supplier, and as follows:

.1 Fully Templated Mortised Hardware: Factory blank, reinforce, drill, and tap doors.
.2 Non-Fully Templated Mortised Hardware: Factory blank and reinforce only.
.3 Surface Mounted Hardware: Factory reinforce only.
.4 Templated Holes 13 mm and Larger: Factory prepared, except mounting and through bolt holes shall be site prepared at the time of application.
.5 Templated Holes Less Than 13 mm Ø: Factory prepared only when required for the function of the device (for knobs, levers, cylinders, thumb or turn pieces) or when holes overlap function holes.
.6 Site drill and tap for surface mounted hardware or mortised hardware that is not fully templated at the time of hardware application.

.2 Hardware Reinforcement for Doors and Frames: Carbon steel, welded in place, prime painted, to the following minimum nominal thicknesses in accordance with CSDMA Recommended Specifications for Commercial Steel Door and Frame Products – Table 1: Accessories (Doors and Frames), and the following:

.1 Protect strike, reinforcement completely by guard boxes welded to frame.
.2 Provide guard boxes to protect mortised cut-outs from mortar and spray applied insulation, fully sealed.

.3 Electronic Door Hardware Preparation:

.1 Provide templated, electrical passageways, hardware enclosures and junction boxes in accordance with manufacturer's standard requirements, and as required to maintain ULC Fire Labelling requirements; inter-connected with CSA approved conduit, passageways, and connectors:

.1 Coordinate requirements of door and frame supply for provision of shallow junction boxes supplied and installed by Division 26 – Electrical.

.2 Coordinate with hardware specified in Section 08 71 00 – Door Hardware and Division 28 – Electronic Safety and Security for locations of conduit connections in doors and door frames; confirm security requirements before manufacturing hollow metal doors and frames.

2.6 Finishing

.1 Shop apply zinc rich primer to repair damaged zinc coatings arising from fabrication; cure primer fully before shipping to site; include compatible primer for site finishing and correction of surface abrasions to zinc coatings and factory applied primer.

.2 Remove weld slag and splatter from exposed surfaces.

.3 Fill and sand smooth tool marks, abrasions, and surface blemishes to present smooth uniform surfaces.

3. EXECUTION

3.1 Examination

.1 Examine substrates, door swing arcs, areas of installation and conditions affecting installation for compliance with requirements for manufacturer's installation tolerances and other conditions affecting performance of work of this Section.

.2 Verify roughing-in for embedded and built-in anchor locations before installing frames.

.3 Verify door and frame size, door swing and ratings with door opening number before installing frames.

.4 Installation of hollow metal doors and frames will denote acceptance of site conditions.

3.2 Installation

.1 Install steel doors, frames, and accessories in accordance with reviewed shop drawings, ANSI A250.11 and CSDMA Installation Guide, manufacturer's data, and as specified in this Section.

.2 Door Frames:

.1 Remove temporary spreaders before installing door frames, leaving exposed surfaces smooth and undamaged.

.2 Set frames accurately in position, plumbed, aligned, and braced securely until permanent anchors are set; limit of acceptable frame distortion 2 mm out of plumb measured on face of frame, maximum twist corner to corner of 3 mm; align horizontal lines in final assembly.

.3 Brace frames rigidly in position until adjacent construction is complete; install wooden spreaders at third points of frame rebate to maintain frame width, install centre brace to support head of frames 1200 mm and wider in accordance with ANSI A250.11 and CSDMA Installation Guide; do not use temporary metal spreaders for bracing of frames 1.

.4 Place frames before construction of enclosing walls and ceilings allowing for deflection of adjacent construction to ensure that structural loads are not transmitted to frames, and as follows:

.1 Check and correct opening width and height, squareness, alignment, twist, and plumb as frames are installed in accordance with CSDMA Recommended Dimensional Standards for Commercial Steel Doors and Frames.

.2 Masonry construction: Provide a minimum of three wall anchors per jamb; install adjacent to hinge location on hinge jamb and at corresponding heights on strike jamb.

.3 Metal Stud Partitions: Provide a minimum of three wall anchors per jamb for frames up to 2150 mm high and 1 additional anchor for each 600 mm over 2150 mm high; install adjacent to hinge location on hinge jamb and at corresponding heights on strike jamb; attach wall anchors to studs with screws.

.4 Remove wooden braces after frames are securely fastened or attached to adjacent construction.

.5 Install glazing materials and studded door silencers.

.6 Assemble large screens on site to provide true and even alignment with flush butt hairline jointing, all fasteners concealed.

.7 Do not site weld unless approved by Consultant in writing for the specific screen.

.8 Coordinate grouting of all frames solid to adjacent construction.

.9 Provide formed steel drip section full width of frame opening for exterior doors.

.10 Fill exterior frames with foamed-in-place insulation before installation of sealants and back-up materials.

.11 Install fire rated frames in accordance with NFPA 80.

.3 Frame Tolerances: Install frames to tolerances listed in ANSI A250.11 and CSDMA Installation Guide, and as follows:

.1 Squareness: Maximum 1.6 mm measured across opening between hinge jam and strike jamb.

.2 Plumbness: Maximum 1.6 mm measured from bottom of frame to head level.

.3 Alignment: Maximum 1.6 mm measured offset between face of hinge jamb and strike jamb relative to wall construction.

.4 Twist: Maximum 1.6 mm measured from leading edge of outside frame rabbet to leading edge of inside frame rabbet.

.4 Doors:

.1 Fit hollow metal doors accurately in frames within clearances required for proper operation, shim as necessary for proper operation.

.2 Install hardware in accordance with manufacturers' templates and instructions.

.3 Adjust operable parts for correct clearances and function.

.4 Install glazing materials and door silencers.

.5 Install fire rated doors within clearances specified in NFPA 80.

3.3 Closeout Activities

.1 Adjusting and Cleaning: Immediately after installation, sand smooth any rusted or damaged areas of prime coat and apply touch up of air-drying primer compatible with factory applied primer, and as follows:

.1 Clean exposed surfaces with soap and water to remove foreign matter before site touch-up.

.2 Finish exposed site welds to a smooth uniform surface and touch-up with site applied rust inhibitive primer.

.3 Site apply touch-up primer on exposed surfaces where zinc coating or factory applied primer has been damaged during installation or handling.

.2 Keep steel surfaces free of grout, tar or other bonding materials or sealers; clean grout or other bonding material from surfaces immediately following installation.

END OF SECTION

1. GENERAL

1.1 Summary

.1 This Section includes requirements for supply and installation of commercial door hardware for the following:

.1 Swinging doors, to match existing.

.2 Coordinating, purchasing, delivering, and scheduling of items specified in this Section is the responsibility of this Section.

1.2 Reference Standards

.1 American National Standards Institute (ANSI)/Builders Hardware Manufacturers Association (BHMA):

.1 ANSI/BHMA A156 Series
.2 ANSI/BHMA A156, Power Operated Pedestrian Doors
.3 ANSI/BHMA A156, Materials and Finishes
.4 ANSI/BHMA A156, Power Assist and Low Energy Power Operated Doors
.5 ANSI/ICC A117.1, Standard for Accessible and Usable Buildings and Facilities

.2 Builders Hardware Manufacturers Association (BHMA):

.1 The BHMA Certified Products Directory (CPD)

.3 Door and Hardware Institute (DHI):

.1 DHI-A115.1G, Installation Guide for Doors and Hardware
.2 Sequence and Format for the Hardware Schedule

.4 National Fire Protection Association (NFPA):

.1 NFPA 80-2022, Standard for Fire Doors and Other Opening Protectives
.2 NFPA 101-2021, Life Safety Code®

.5 Underwriters Laboratories of Canada (ULC):

.1 UL 228-2008, Standard for Door Closers-Holders, With or Without Integral Smoke Detectors
.2 UL 437-2013, Standard for Key Locks

1.3 Administrative Requirements

.1 Submission of Substitutions: The hardware listed in the Door Hardware Schedule establishes the quality standards, finishes, manufacturers, and functions; Materials other than the named products for the Project may be acceptable to the Consultant. Submit information as follows:

.1 The Consultant will review all proposed alternates prior to close of bids when submitted no later than seven (7) days prior to bid closing date as follows:

.1 Proposed alternates shall match colour range, texture, and performance characteristics of named products, and shall not require a change to the colour board for the Project.
.2 Proposed alternates found acceptable by the Consultant will be listed in the form of an Addendum.
.3 The Consultant is not obliged to accept any materials presented for their review and does not need to provide reasons for rejection of proposed alternates.

.2 Preinstallation Conference: Arrange a pre-construction meeting in accordance with Section 01 31 19 – Project Meetings, attended by Construction Manager, Subcontractor, Consultant, Owner, and Hardware Consultant to discuss the following:

.1 Keying Conference: Conduct keying conference at Project site and incorporate decisions into final keying schedule after reviewing door hardware keying system including, but not limited to, the following:

.1 Function of building, flow of traffic, purpose of each area, degree of security required, and plans for future expansion
.2 Preliminary key system schematic diagram
.3 Requirements for key control system
.4 Address for delivery of keys

.2 Electrified Hardware Conference: Conduct preinstallation conference at Project site and review methods and procedures related to electrified door hardware including, but not limited to, the following:

.1 Review and discuss electrical roughing in and other preparatory work performed by other trades.
.2 Review sequence of operation for each type of electrified door hardware.
.3 Review and finalize construction schedule and verify availability of materials, Installer's personnel, equipment, and facilities needed to make progress and avoid delays.
.4 Review required testing, inspecting, and certifying procedures.

.3 Coordination: Obtain and distribute templates for doors, frames, and other work specified to be factory prepared for installing door hardware and coordinate with shop drawings of other work to confirm that adequate provisions are made for locating and installing door hardware in accordance with indicated requirements, and as follows:

.1 Coordinate with Division 26 – Electrical for type of wire required for electronic hardware, schedule for installation, and connection to electronic hardware.
.2 Coordinate layout and installation of recessed pivots and closers and cast in anchoring inserts into floor construction with Division 03 – Concrete.
.3 Coordinate layout and installation of electrified door hardware with connections to power supplies, fire alarm system and detection devices, access control system, security system, and building control system.

.4 Coordinate the work of all trades, including glass and glazing, masonry, and electrical requirements covered in manufacturer’s details and appropriate sections of the specifications and as follows:

.1 Coordinate with electrical contractor to provide 120V, 60 cycle, single phase 15 Amp or 30 Amp service depending on quantity of operators, as indicated in Division 26 – Electrical, and as follows:

.1 Coordinate with electrical contractor for provision of service to each operator from junction box for multiple operators.
.2 Coordinate with electrical contractor shall provide electrical conduit and wiring from specified controls to operators as outlined on manufacturer’s drawings.

1.4 Submittals

.1 Provide required information in accordance with Section 01 33 00 – Submittal Procedures.

.2 Action Submittals: Provide the following submittals before starting any work of this Section:

.1 Product Data: Submit product data indicating installation details, material descriptions, dimensions of individual components and profiles, and finishes.
.2 Shop Drawings: Submit shop drawings indicating details of electrified door hardware including, but not limited to, the following:

.1 Wiring Diagrams: Detail wiring for power, signal, and control systems and differentiate between manufacturer installed and site installed wiring, and as follows:

- System schematic.
- Point-to-point wiring diagram.
- Riser diagram.
- Elevation of each door.

.2 Detail interface between electrified door hardware and fire alarm, access control, security, and building control system.

.3 Theory of operation for electrified hardware groups.

.4 Prepare drawings specifically for the project and submit in hard copy and CAD format:

- Photocopied drawings and hand reproduced drawings are not acceptable.
- Submit separate elevations and interconnect drawings for each different electrified hardware group.

.3 Hardware Schedule: Submit door hardware schedule prepared by or under the supervision of qualified Architectural Hardware Consultant (AHC), detailing fabrication and assembly of door hardware, and as follows:

.1 Coordinate with – Door Schedule on drawings for size and thickness of doors, fire rating, and comments relating to door function.

.2 Comply with the Door and Hardware Institutes recommended scheduling sequence and vertical format for hardware schedules.

.3 Organize the door hardware schedule into door hardware sets indicating complete designations of every item required for each door or opening; include the following information:

- Type, style, function, size, label, hand, and finish of each door hardware item.
- Manufacturer of each item.
- Fastenings and other pertinent information.
- Location of each door hardware set, cross-referenced to drawings, both on floor plans, and door and frame schedule.
- Explanation of abbreviations, symbols, and codes contained in schedule.
- Mounting locations for door hardware.
- Door and frame sizes and materials.
- Description of each electrified door hardware function, including location, sequence of operation, and interface with other building control systems.

.4 Keying Schedule: Submit keying schedule prepared by or under the supervision of qualified Architectural Hardware Consultant (AHC), detailing Owner's final keying instructions for locks, including schematic keying diagram and index each key set to unique door designations.

.3 Informational Submittals: Provide the following submittals when requested by the Consultant:

.1 Certificates: Submit product certificates signed by manufacturer of door hardware certifying that products submitted comply with requirements for labelled fire doors, for types and sizes of doors used for the Project.

.2 Source Quality Control Submittals: Submit proof of participation in DHI Continuing Education Program and apply AHC stamp to completed door hardware schedule.

1.5 Project Closeout Submissions

.1 Operation and Maintenance Data: Provide copies of manufacturer’s written maintenance information for inclusion into the operations and maintenance information. Indicate components that require specific handling to avoid damage to the finished Work.

.2 Spare Parts and Tools: Submit unique parts and tools for maintaining hardware systems.

1.6 Quality Assurance

.1 Regulatory Requirements:

.1 Building Code Compliance: Conform to ULC and Building Code requirements, as applicable to hardware, for labelled or rated doors and frames, and for exiting, operation and function.
.2 Manufacturing Compliance: Use only products listed in the BHMA Certified Products Directory (CPD) for hardware of this Project.

.2 Qualifications: Provide proof of qualifications when requested by Consultant:

.1 Supplier: Use a door hardware supplier having warehousing facilities in Project's vicinity and employing at least one permanent staff member who is a fully certified and licensed Architectural Hardware Consultant (AHC), participating in the DHI Continuing Education Program, who will be responsible for the preparation of the door hardware schedule submittal, and as follows:

.1 Door hardware supplier shall be available during the course of the Work to consult with Contractor, Consultant, and Owner about door hardware and keying.
.2 Door hardware supplier shall have completed projects with electrified door hardware similar in material, design, and extent to that indicated for this Project, and who has the capability of preparing data for electrified door hardware, including shop drawings, based on testing and engineering analysis of manufacturer's standard units in assemblies similar to those indicated for this Project.

.2 Installer: Installer shall have completed door hardware similar in material, design, and extent to that indicated with a record of successful in service performance for the last three (3) years.

.3 Performance Requirements: Obtain each type and variety of door hardware from a single manufacturer, unless otherwise indicated, and generally comply with the following provisions:

.1 Accessibility requirements in accordance with ANSI 117.1.
.2 Handles, Pulls, Latches, Locks, and other Operating Devices: Shape that is easy to grasp with one hand and does not require tight grasping, tight pinching, or twisting of the wrist.
.3 Door Closers: Maximum opening force requirements as follows:

.1 Interior Hinged Doors: Nominal 20 N applied perpendicular to door.
.2 Fire Doors: Minimum opening force allowable by authorities having jurisdiction.

.4 Thresholds: Maximum 13 mm high; bevel raised thresholds with a slope of maximum 1:2.
.5 Latches, Locks, and Exit Devices: Nominal 65 N to release the latch, and shall not require the use of a key, tool, or special knowledge for operation.
.6 Delayed-Egress Locks: Lock releases within 15 seconds after applying a force nominal 90 N.
.7 Door Closers: Nominal 130 N to set door in motion and nominal 65 N to open door to minimum required width.

1.7 Delivery, Storage, And Handling

.1 Delivery and Acceptance Requirements: Deliver hardware items in original factory containers, clearly labelling contents and scheduled use for this project and as follows:

.1 Inventory door hardware on receipt and provide secure lock up for door hardware delivered to Project site.
.2 Store hardware in a clean, well illuminated (500 lux minimum) securely locked storage room accessible only to authorized personnel.

.2 Storage and Handling Requirements: Store hardware items on shelves; not on floors, separated and packaged as a group for each individual door with the door number, and list of items for that door on each package related to the door hardware schedule, and include basic installation instructions with each item or package and as follows:

.1 Maintain an itemized inventory list of each item, updated on a daily basis, to show items in storage and items installed.
.2 Deliver keys to manufacturer of key control system.

1.8 Warranty

.1 Provide written warranty, executed by manufacturer agreeing to repair or replace components of door hardware that fail in materials or workmanship within specified warranty period.

.2 Failures include, but are not limited to, the following:

.1 Structural failures including excessive deflection, cracking, or breakage.
.2 Faulty operation of operators and door hardware.
.3 Deterioration of metals, metal finishes, and other materials beyond normal weathering.

.3 Warranty Period: From date of Substantial Performance, and as follows:

Hardware Type	Warranty Term
Locks, latches, and cylinders	2 years
Closers	10 years
Hinges	Lifetime
Panics	1 year
Miscellaneous	1 year
Electrical Hardware:	5 years

2. PRODUCTS

2.1 Scheduled Door Hardware

.1 Provide door hardware for each door in accordance with requirements indicated in this Section, door hardware sets indicated in door, frame, and hardware schedule in Drawing A0.01 – Construction Assemblies & General Notes, and the Hardware Schedule included in – Door Hardware Schedule on drawings.

.2 Alternates to the hardware listed in the Door Hardware Schedule will be considered based on acceptable product manufacturers listed below in this Section.

2.2 Manufacturers

.1 Acceptable Products Manufacturers: Subject to compliance with requirements specified in this Section, use any of the following listed manufacturers' products, provided required product data and shop drawing are submitted before starting any work of this Section:

.1 Hinges:

.1 Hager Companies (HAG).
.2 McKinney Products Company (MCK).
.3 Mont-Hard Corporation (MH).
.4 Stanley Commercial Hardware (STH).

.2 Mechanical Locks and Latches:

.1 Best Lock Corporation (BLC)
.2 Corbin Russwin Architectural Hardware (CR)
.3 Sargent Manufacturing Company (SGT)

.4 Schlage Lock Company (SCH)

.3 Electromagnetic Locks and Latches:

.1 Sargent Manufacturing Company (SGT).
.2 Securitron Magnalock Corp. (SMC).
.3 Von Duprin, Inc. (VD).
.4 Yale Security Inc. (YAL).

.4 Electromechanical Locks and Latches:

.1 Sargent Manufacturing Company (SGT).
.2 Schlage Lock Company (SCH).
.3 Yale Security Inc. (YAL).

.5 Flush Bolts:

.1 Adams Rite Manufacturing Co. (ARM).
.2 Glynn-Johnson (GJ).
.3 Hager Companies (HAG).
.4 Ives (IVS).
.5 Sargent Manufacturing Company (SGT).

.6 Exit Devices:

.1 Sargent Manufacturing Company (SGT).
.2 Von Duprin (VD).
.3 Yale Security Inc. (YAL).

.7 Cylinders:

.1 ASSA ABLOY, Inc. (ABL).
.2 Best Lock Corporation (BLC).
.3 Sargent Manufacturing Company (SGT).
.4 Schlage Lock Company (SCH).

.8 Key Control Systems:

.1 Key Control Systems, Inc. (KCS)
.2 Major Metalfab Co. (MM)
.3 Sargent Manufacturing Company (SGT)

.9 Electric Strikes:

.1 Adams Rite Manufacturing Co. (ARM).
.2 Folger Adam Security Inc. (FAS).
.3 Locknetics Security Engineering (LSE).
.4 Precision Hardware, Inc. (PH).
.5 Rutherford Controls Inc. (RC).
.6 Von Duprin, Inc. (VD).

.10 Weatherstrip, Door Sweep, Thresholds

.1 Pemko.
.2 KN Crowder.
.3 Zero.
.4 National Guard.
.5 Draft Seal.

.2 Substitutions: Additional manufacturers offering similar products to Acceptable Products Manufacturers listed above may be incorporated into the work provided they meet the performance requirements established by the named products and provided they submit requests for substitution.

2.3 Materials

.1 Materials and Finishes: Materials and finishes matching scheduled hardware, meeting requirements of BHMA A156.18, and performance required for installation.

2.4 Automatic Swing Door Operators

.1 Coordinate the work of all trades, including glass and glazing, masonry, and electrical requirements covered in manufacturer's details and appropriate sections of the specifications.

.2 The electrical contractor shall provide 117 volt, 60 cycle, single phase 15 ampere service for 1-2 operators, 30 ampere service for 3-4 operators, and as follows:

.1 Coordinate with electrical contractor for provision of service to each operator from junction box for multiple operators.
.2 Coordinate with electrical contractor shall provide electrical conduit and wiring from specified controls to operators as outlined on manufacturer's drawings.

.3 Finish hardware supplier shall Provide and install concealed electro-mechanical swing door operator, consisting of electro-mechanical swinging door operator and electronic control, aluminum header, connecting hardware, and power on/off switch and safety sensor, and as follows:

.1 Automatic entrance equipment: comply with ANSI A156.10 or A156.19.
.2 Aluminium header extrusions: minimum nominal 4 mm wall thickness with finish to match adjacent aluminum materials.
.3 Equipment must operate between -35°C and +55°C in all climate conditions.
.4 Operator: Electro-mechanical system installed in a header to resist dust, dirt, and corrosion; entire operator shall be removable from the header as a unit.
.5 Bearings: Fully lubricated and sealed to minimize wear and friction.

.4 Operator shall open the door with a 1/8 HP motor through reduction gears, door arm, and linkage assembly, and as follows:

.1 Low energy operator, door opening time to be not less than 4 seconds.
.2 The drive train shall have a positive, constant engagement. The operator shall stop the door in the open position by electrically reducing the motor voltage and stalling against a 90° stop.
.3 Close the door by spring energy; controlled by employing the motor as a dynamic brake.
.4 Door closing time shall not be less then 4.5 seconds.
.5 Pre-load closing spring for positive closing action at a low material stress level for long spring life.
.6 Provide obstruction detection to reverse door when closing if an object stops the door [and to stop door from opening if object is detected on swing side].
.7 The operator shall function as a manual door closer in the direction of swing with or without electrical power.

.5 The door forces and speeds generated during power opening, and manual opening in both directions of swing, and spring closing in both directions of swing shall conform to the requirements of ANSI A156.10 or A156.19.

.6 Verify that no defects or errors are present in completed phases of the work that would result in poor application or installation or cause latent defects of the automatic door equipment.

.7 Installation and warranty adjustments shall be performed by authorized distributors' factory trained technician.

2.5 Stainless Steel Threshold At Fire Rated Doors

.1 Provide brushed finish stainless steel threshold in accordance with NFPA 80 and NFPA 101 at all fire rated doors as indicated on Drawings, and as follows:

.1 Basis-of-Design Material: Draft Seal Ltd., Flat Threshold, Stainless Steel, Product No. DS5006SS.

2.6 Keying

.1 Permanent Cores: Manufacturer's standard; finish face to match lockset; in accordance with the following:

.1 Removable Cores: Core insert, removable by use of a special key, and for use with only the core manufacturer's cylinder and door hardware.

.2 Construction Keying:

.1 Construction Master Keys: [Provide cylinders with feature that permits voiding of construction keys without cylinder removal. Provide 10 construction master keys.] [Provide construction cores that are replaceable by permanent cores. Provide 10 construction master keys.]

.1 [Replace construction cores with permanent cores, as [indicated in keying schedule] [directed by Owner].] [Provide permanent cores to Owner for installation.]

.3 Keying System:

.1 Provide a [factory registered] keying system in accordance with the following requirements:
.2 No Master Key System: Cylinders are operated by change keys only.
.3 Master Key System: Cylinders are operated by a change key and a master key.
.4 Grand Master Key System: Cylinders are operated by a change key, a master key, and a grand master key.
.5 Great-Grand Master Key System: Cylinders are operated by a change key, a master key, a grand master key, and a great-grand master key.
.6 [Existing System: Master key or grand master key locks to Owner's existing system.]
.7 [Existing System: Re-key Owner's existing master key system into new keying system.]
.8 Keyed Alike: Key all cylinders to the same change key; cylinders [master keyed] [not master keyed].

.4 Keys: Provide nickel-silver keys in accordance with the following:

.1 Stamping: Permanently inscribe each key with a visual key control number and notation stating, “DO NOT DUPLICATE”.
.2 Quantity: In addition to one extra blank key for each lock, provide the following:

.1 Cylinder Change Keys: [Three]
.2 Master Keys: [Five]
.3 Grand Master Keys: [Five]
.4 Great-Grand Master Keys: [Five]

2.7 Key Control Cabinets

.1 Multiple Drawer Cabinet: Cabinet with drawers equipped with key holding panels and key envelope storage, and progressive-type ball-bearing suspension slides. Include single cylinder lock to lock all drawers.

.2 Wall Mounted Cabinet: Cabinet with hinged-panel door equipped with key holding panels and pin-tumbler cylinder door lock.

.3 Portable Cabinet: Tray for mounting in file cabinet, equipped with key-holding panels, envelopes, and cross-index system.

.4 Capacity: Able to hold keys for 150% of the number of locks.

.5 Cross Index System: Set up by key control manufacturer, in accordance with the following:

.1 [Card Index: Provide four sets of index cards for recording key information. Include three receipt forms for each key-holding hook.] [Computer Software: Provide cross-index software for recording and reporting key-holder listings, tracking keys and lock and key history, and printing receipts for transactions. Include instruction manual.]

3. EXECUTION

3.1 Examination

.1 Examine doors and frames, with installer present, for compliance with requirements for installation tolerances, labelled fire door assembly construction, wall and floor construction, and other conditions affecting performance.

.2 Examine roughing-in for electrical power systems to verify actual locations of wiring connections before electrified door hardware installation.

.3 Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 Preparation

.1 Prepare steel doors and frames in accordance with DHI A115 Series.

3.3 Installation

.1 Mounting Heights: Mount door hardware units at heights indicated in following applicable publications, unless specifically indicated or required in accordance with governing regulations:

.1 Standard Steel Doors and Frames: DHI's Recommended Locations for Architectural Hardware for Standard Steel Doors and Frames.

.2 Install each door hardware item in accordance with manufacturer's written instructions.

.3 Coordinate removal, storage, and reinstallation of surface protective trim units with finishing work specified in Division 09 – Finishes where cutting and fitting are required to install door hardware onto or into surfaces that are later to be painted or finished in another way.

.4 Do not install surface mounted items until finishes have been completed on substrates involved, and as follows:

.1 Set units level, plumb, and true to line and location.
.2 Adjust and reinforce attachment substrates as necessary for proper installation and operation.
.3 Drill and countersink units that are not factory prepared for anchorage fasteners.
.4 Space fasteners and anchors according to industry standards.

.5 Key Control System: Place keys on markers and hooks in key control system cabinet, as determined by final keying schedule.

.6 Boxed Power Supplies: Locate power supplies as indicated or, if not indicated, [above accessible ceilings] [in equipment room]; verify location with Consultant, and as follows:

.1 Configuration: [Provide one power supply for each door opening.] [Provide the least number of power supplies required to adequately serve doors with electrified door hardware.]

.7 Thresholds: Set thresholds for exterior and acoustical doors in full bed of sealant in accordance with requirements specified in Section 07 92 00 – Joint Sealants.

.8 Stainless steel threshold at fire rated doors: Set thresholds in full bed of epoxy adhesive.

3.4 Site Quality Control

.1 Independent Architectural Hardware Consultant: Owner will engage a qualified independent Architectural Hardware Consultant to perform inspections and to prepare inspection reports.

.2 Independent Architectural Hardware Consultant will inspect door hardware and state in each report whether installed work complies with or deviates from requirements, including whether door hardware is properly installed and adjusted, and as follows:

.1 Testing: Consists of Dynamic, static and system tests.
.2 Dynamic tests shall be conducted to before terminating devices to ensure door mechanics, sensors and locking devices mechanically functions correctly and free of grounds and shorts.
.3 Static tests shall be conducted before interconnecting devices to ensure all equipment functions correctly when energized.
.4 System tests shall be conducted to test system fully and to include fire alarm integration.

3.5 Adjusting

.1 Initial Adjustment: Adjust and check each operating item of door hardware and each door to ensure proper operation or function of every unit. Replace units that cannot be adjusted to operate as intended. Adjust door control devices to compensate for final operation of heating and ventilating equipment and in accordance with referenced accessibility requirements:

.1 Spring Hinges: Adjust to achieve positive latching when door is allowed to close freely from an open position of 30 degrees.
.2 Electric Strikes: Adjust horizontal and vertical alignment of keeper to properly engage lock bolt.
.3 Door Closers: Adjust sweep period so that, from an open position of 70°, the door will take at least 3 seconds to move to a point 75 mm from the latch, measured to the leading edge of the door.

.2 Six Month Adjustment: Approximately six months after date of Substantial Performance, perform the following:

.1 Examine and readjust each item of door hardware as necessary to ensure function of doors, door hardware, and electrified door hardware.
.2 Consult with and instruct Owner's personnel on recommended maintenance procedures.
.3 Replace door hardware items that have deteriorated or failed due to faulty design, materials, or installation of door hardware units.

3.6 Closeout Activities

.1 Clean adjacent surfaces soiled by door hardware installation.

.2 Clean operating items as necessary to restore proper function and finish.

.3 Provide final protection and maintain conditions that ensure door hardware is without damage or deterioration at time of Substantial Completion.

3.7 Demonstration

.1 Engage a factory authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain door hardware and door hardware finishes.

3.8 Door Hardware Schedule

.1 Refer to – Door Hardware Schedule on drawings.

END OF SECTION

1 GENERAL

1.1 Summary

.1 This Section includes requirements for supply and installation of exterior and interior glass for windows, doors, storefronts, entrances, including glazing sealants and accessories required for a complete and functional installation.

1.2 Definitions

.1 Terminology: Definitions and terms for glass and glazing used in this Section are based on definitions provided in ASTM C162.

1.3 Reference Standards

.1 American National Standards Institute (ANSI):

.1 ANSI Z97.1, Safety Glazing Materials used in Buildings: Safety Performance Specifications and Methods of Test

.2 American Society for Testing and Materials (ASTM International):

.1 ASTM C162, Standard Terminology of Glass and Glass Products
.2 ASTM C920, Standard for Elastomeric Joint Sealants

.3 Canadian General Standards Board (CGSB):

.1 CAN/CGSB 12.1, Safety Glazing

.4 Glass Association of North America (GANA):

.1 GANA Glazing Manual
.2 GANA Engineering Standards Manual

.5 Insulating Glass Manufacturers Alliance (IGMA):

.1 IGMA Insulating Glass Manufacturing Quality Procedures
.2 IGMA Certification Program Manual
.3 IGMA Certified Products Directory

1.4 Administrative Requirements

.1 Coordination: Coordinate work of this Section with the installation of frames to ensure a continuous, uninterrupted sequence, and to prevent the undue exposure of unprotected frames to weather, and as follows:

.1 Coordinate glazing channel dimensions to provide necessary bite on glass, minimum edge and face clearances, and adequate sealant thicknesses, using reasonable tolerances.
.2 Install glass lites only after nearby welding is completed.
.3 Mark each lite of glass as it is installed in a manner to make it visible and obvious to all persons.
.4 Do not use materials that may permanently mar, discolour, or disfigure the glass.

.2 Pre-Construction Meetings: Conduct a pre-construction meeting before starting any work of this Section, attended by the Consultant, Construction Manager, Subcontractor and others that are affected by work of this Section to discuss the following:

.1 Review and finalize construction schedule and verify availability of materials, installer's personnel, equipment, and facilities needed to make progress and avoid delays.
.2 Review temporary protection requirements for glazing during and after installation.

1.5 Submittals

.1 Action Submittals: Provide the following submittals before starting any work of this Section:

.1 Glazing Schedule: Submit glazing schedule using same designations indicating in this Section and on Drawings listing glass types and thicknesses for size of opening and location.

1.6 Project Closeout Submissions

.1 Operation and Maintenance Data: Submit copies of manufacturer’s written maintenance information for inclusion in the operations manual; provide specific warning of any maintenance practice or materials that may damage or disfigure the finished Work.

1.7 Quality Assurance

.1 Qualifications: Provide proof of qualifications when requested by Consultant:

.1 Source Limitations: Obtain Products from a single fabricator using glass and accessory products sourced from a single manufacturer.
.2 Fabricators: Obtain Products from fabricators acceptable to manufacturer of products proposed for use in the Work.
.3 Installers: Use glazing Subcontractors that employ personnel certified by a provincially recognized apprenticeship/journeyman/master glazier program, and that have experience with projects of similar extent and complexity required for the Project.

1.8 Delivery, Storage And Handling

.1 Delivery and Acceptance Requirements: Deliver packaged materials in their original containers with manufacturer's labels and seals intact and as follows:

.1 Packaging: Package glass materials to prevent damage to glass and glazing materials resulting from condensation, temperature changes and direct exposure to sun and other causes.
.2 Transportation: Comply with manufacturer’s transportation requirements for protecting insulating glass units; take measures to prevent hermetic seal ruptures resulting from changes in altitude during transportation.

.2 Storage and Handling Requirements: Store vertically, blocked off the floor in a weatherproof enclosure in original containers with manufacturers labels and seals intact until read for installation, and as follows:

.1 Install glass as soon as possible after delivery to site.
.2 Handle glass carefully to its place of installation.
.3 Prevent damage to glass, adjacent materials, and finished surfaces.

1.9 Site Conditions

.1 Ambient Conditions: Maintain temperature, humidity, and solar exposure conditions of glass glazing materials during shipping, storage and site installation as required by manufacturer to maintain warranty and performance of installed products, and as follows:

.1 Install glazing when ambient temperature is above manufacturer's written minimum requirement and rising.
.2 Maintain ventilated environment for 24 hours after installation.
.3 Maintain minimum ambient temperature before, during and 24 hours after installation of glazing compounds that require curing.

1.10 Warranty

.1 Manufacturer's Warranty: Manufacturer's standard form, made out to Owner and signed by glass manufacturer agreeing to replace glass units that deteriorate within the specified warranty period, commencing from date of Substantial Performance of the Work and for Warranty Conditions listed below:

.2 Warranty Condition – Glass Coatings: Manufacturer's warranty statement describing replacement of coated-glass units that deteriorate as follows:

.1 Coating Failure: Defects developed from normal use that are attributed to the manufacturing process and not to causes other than glass breakage and practices for maintaining and cleaning coated-glass contrary to manufacturer's written instructions.
.2 Evidence of Failure: Observations indicating conditions such as peeling, cracking, and other indications of deterioration in metallic coating.
.3 Warranty Period: Ten (10) years.

.3 Warranty Condition – Glass Seals: Manufacturer's warranty statement describing replacement of sealed-glass units that deteriorate as follows:

.1 Seal Failure: Failure of hermetic seal under normal use that is attributed to the manufacturing process and not to causes other than glass breakage and practices for maintaining and cleaning insulating glass contrary to manufacturer's written instructions.
.2 Evidence of Failure: Obstruction of vision by dust, moisture, or film on interior surfaces of glass as described in ASTM C1036, ASTM E2188, ASTM E2190 and IGMA Definition TB-1205.
.3 Warranty Period: Ten (10) years.

2. PRODUCTS

2.1 Manufacturers

.1 Basis-of-Design Products: Products named in this Section were used as the basis-of-design for the project; manufacturers listed as additional Acceptable Products and that offer similar products may be incorporated into the work of this Section, provided they meet the performance requirements established by the named products.

.2 Additional Acceptable Products Manufacturers: Subject to compliance with requirements specified in this Section, use any of the following listed manufacturers' products, provided required product data and shop drawing are submitted before starting any work of this Section:

.1 Glazing Manufacturers:

.1 Cardinal Glass Industries
.2 Guardian Glass
.3 Pilkington North America
.4 Schott Glass AG
.5 Viracon

.6 Vitro Architectural Glass

.3 Substitutions: Additional manufacturers offering similar products to Acceptable Products Manufacturers listed above may be incorporated into the work provided they meet the performance requirements established by the named products and provided they submit requests for substitution.

2.2 Regulatory Requirements

.1 Design Standard: Design glass in accordance with loads described in Part 4 of the British Columbia Building Code (BCBC).

.2 Safety Glazing Labelling: Label safety glazing components in accordance with CAN/CGSB 12.1, applied square and aligned to glass borders, readable from interior and containing the following:

.1 Name of Glazing Company,
.2 Composition (Laminated, Laminated/Heat Strengthened or Tempered),
.3 Applicable Standards (CGSB, ANSI or ASTM),
.4 Specialty Application Marking (Appropriate to Materials),
.5 Plant Identification; and
.6 Date Code (Year-Month-Day) of Manufacture.
.7 Acceptable Substitution: Consultant will consider Products meeting requirements for ANSI Z97.1 instead of CAN/CGSB 12.1, without a request for substitution.

2.3 Materials – Wired Glass

.1 Wired Safety Glass: In accordance with CAN/CGSB-12.11 and as follows:

.1 Type: 1 – polished both sides, transparent.
.2 Wire Mesh Style: 3 – Square.

2.4 Accessories

.1 Spacer/Separator: Enhanced insulating edge spacer, thermoset foam spacer incorporating primary seal, desiccant, and secondary seal, and as follows:

.1 Basis-of-Design Products: Quanex Super Spacer TriSeal, aluminum/grey coloured.

.2 Sealants for Insulating Glass Units:

.1 Primary Seal: Polyisobutylene; colour black.
.2 Secondary Seal: Structural silicone based, conforming to ASTM C920, Type S, Grade NS, Class 25, Use NT, G and A, colour aluminum/grey.
.3 Acceptable Products:

.1 Momentive Ultraglaze SSG4000.
.2 Dowsil 995.
.3 Tremco Spectrem 2.

.3 Cleaners, Primers, and Sealers: Type recommended by manufacturer of glass and gaskets.

.4 Glazing Compound: For glazing to metal, in accordance with CAN/CGSB 19.2.

2.5 Fabrication

.1 Fabrication Tolerances: Cut glass to required size allowing for proper clearances and to produce clean, straight edges with no chips, cracks, or flaws; make cut outs and openings to locations and sized indicated on Drawings, and grind edges smooth round off corners.

.2 Cut wired glass so that wires are parallel with edges both vertically and horizontally.

3. EXECUTION

3.1 Examination

.1 Verification of Conditions: Verify that openings for glazing are correctly sized and within tolerance and confirm the following:

.1 Manufacturing and installation tolerances for framing system, including size, squareness and offsets at corners.
.2 Functional weep system is in place for exterior glass installation.
.3 Minimum required face or edge clearances.
.4 Effective sealing between joints of glass framing components.

.2 Proceed with installation of glass units only after unsatisfactory conditions are corrected.

3.2 Preparation

.1 Clean and prepare glazing channels, rebates, and other framing members; confirm they are smooth and true, free of projections and that fastenings are properly set to prevent contact with glass.

3.3 Installation

.1 Perform glazing work in accordance with glass manufacturer’s written installation requirements.

.2 Monolithic and Insulating Glass Units: Glaze glass into framing materials in accordance with combined written instructions of manufacturers of glass, sealants, gaskets, and other glazing materials listed in Related Requirements and as follows:

.1 Requirements indicated within referenced glazing publications and standards that are more stringent than manufacturer's written instructions will govern in the case of conflict between this specification, manufacturer’s instructions and referenced standards.
.2 Install glass plumb, true, level, and rigid.
.3 Take measures to prevent warp or twist glass to prevent stress or breaking of glass seals.
.4 Crimp capillary breather tube in accordance with fabricator’s written instructions, and as follows:

.1 Do not trim sealant from around base of tube.
.2 Do not pull or attempt to remove the tube.
.3 Crimp tube immediately prior to installing sealed unit by placing pliers perpendicular to tube 25 mm from end of tube.
.4 Do not permit tube to be exposed to or sit in water.
.5 Cover tube with stainless steel strip and set in sealant bead compatible with insulated glass sealants.

.3 Glaze interior doors with foam or cork tape on both sides.

.1 For wired glass, use glazing tape. Trim tape even with the sight line.

3.4 Wired Glass

.1 Install wired glass to locations indicated.

.2 Install wired glass where glazing is indicated in fire resistant closures (e.g. fire doors, steel framed openings in fire rated walls).

.3 Install wired glass with wires parallel to frame opening.

3.5 Glass Schedules

.1 6 mm wired glass as indicated on Drawings.

3.6 Closeout Activities

.1 Cleaning: Wash glass on both exposed surfaces in each area of Project a maximum of four (4) days in advance of site reviews leading up to Substantial Performance and written requirements for washing glass provided by glass manufacturer.

.2 Protection: Protection of Glass: Protect glass from damage immediately after installation using non-staining, non-permanent or temporary coverings held away from glass surfaces and as follows:

.1 Do not apply markers to glass surface.
.2 Remove non-permanent labels and protection immediately prior to declaration of Substantial Performance.

.3 Protective Measures from Adjacent Work: Protect glass from contact with contaminating substances resulting from construction operations, including weld splatter:

.1 Remove deleterious substances immediately as recommended by glass manufacturer when contaminating substances come into contact with glass, despite provision of protective coverings.
.2 Schedule daily or weekly examination of glass surfaces adjacent to or below exterior concrete and other masonry surfaces during the progress of construction as appropriate to construction activities, or other such time period mutually agreeable to the Consultant, Construction Manager and Subcontractor, for buildup of dirt, scum, alkaline deposits, or stains; remove as recommended in writing by glass manufacturer.
.3 Remove and replace glass that is broken, chipped, cracked, or abraded or that is damaged from natural causes, accidents, and vandalism occurring during construction period.

END OF SECTION

1. GENERAL

1.1 Summary

.1 This Section includes requirements for supply and installation of interior gypsum boards for walls and ceilings, interior abuse resistant gypsum boards, tile backing panels, non-load bearing steel stud framing, suspended ceiling and soffit framing for interior gypsum board applications.

.2 This Section includes requirements for design of seismic restraint and bracing, and anchorage for partitions, ceilings and bulkheads with engineered shop drawing and product data submittals acceptable to the Authorities Having Jurisdiction.

1.2 Reference Standards

.1 American Society for Testing Materials (ASTM International):

.1 ASTM A153/A153M, Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware
.2 ASTM A307, Standard Specification for Carbon Steel Bolts, Studs, and Threaded Rod 60 000 PSI Tensile Strength
.3 ASTM A510/A510M, Standard Specification for General Requirements for Wire Rods and Coarse Round Wire, Carbon Steel, and Alloy Steel
.4 ASTM A641/A641M, Standard Specification for Zinc-Coated (Galvanized) Carbon Steel Wire
.5 ASTM A653/A653M, Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process
.6 ASTM C11, Standard Terminology Relating to Gypsum and Related Building Materials and Systems
.7 ASTM C423, Standard Test Method for Sound Absorption and Sound Absorption Coefficients by the Reverberation Room Method
.8 ASTM C475/C475M, Standard Specification for Joint Compound and Joint Tape for Finishing Gypsum Board
.9 ASTM C645, Standard Specification for Non-structural Steel Framing Members
.10 ASTM C754, Standard Specification for Installation of Steel Framing Members to Receive Screw-Attached Gypsum Panel Products
.11 ASTM C834, Standard Specification for Latex Sealants
.12 ASTM C840, Standard Specification for Application and Finishing of Gypsum Board
.13 ASTM C919, Standard Practice for Use of Sealants in Acoustical Applications
.14 ASTM C954, Standard Specification for Steel Drill Screws for the Application of Gypsum Panel Products or Metal Plaster Bases to Steel Studs from 0.033 in. (0.84 mm) to 0.112 in. (2.84 mm) in Thickness
.15 ASTM C1002, Standard Specification for Steel Self-Piercing Tapping Screws for the Application of Gypsum Panel Products or Metal Plaster Bases to Wood Studs or Steel Studs
.16 ASTM C1178/C1178M, Standard Specification for Glass Mat Water-Resistant Gypsum Backing Panel
.17 ASTM C1396/C1396M, Standard Specification for Gypsum Board
.18 ASTM C1658/C1658M, Standard Specification for Glass Mat Gypsum Panels
.19 ASTM D3273, Standard Test Method for Resistance to Growth of Mold on the Surface of Interior Coatings in an Environmental Chamber
.20 ASTM E90, Standard Test Method for Laboratory Measurement of Airborne Sound Transmission Loss of Building Partitions and Elements
.21 ASTM E413, Classification for Rating Sound Insulation
.22 ASTM E488/E488M, Standard Test Methods for Strength of Anchors in Concrete Elements
.23 ASTM E695, Standard Method for Measuring Relative Resistance of Wall, Floor, and Roof Construction to Impact Loading

.2 Canadian General Standards Board (CGSB):

.1 CAN/CGSB 1.181-99, Ready-Mixed organic Zinc-Rich Coating

.3 Canadian Standards Association (CSA Group):

.1 CSA S136-16, North American Specification for the Design of Cold Formed Steel Structural Members

.4 Gypsum Association (GA):

.1 GA-214-2021, Levels of Finish for Gypsum Panel Products
.2 GA-216-2021, Application and Finishing of Gypsum Panel Products
.3 GA-223-2017, Gypsum Panel Products, Types, Uses, Sizes, and Standards
.4 GA-238-2019, Guidelines for Prevention of Mod Growth on Gypsum Board

.5 Underwriters Laboratories of Canada (ULC):

.1 CAN/ULC S102:2018, Standard Method of Test for Surface Burning Characteristics of Building Materials and Assemblies
.2 CAN/ULC S114:2018, Standard Method of Test for Determination of Non-Combustibility in Building Materials
.3 CAN/ULC S702.1-14 (R2019), Standard for Mineral Fibre Thermal Insulation for Buildings
.4 Underwriters' Laboratories of Canada (ULC), List of Equipment and Materials

1.3 Definitions

.1 Delegated Design Professional Engineer: The professional engineer hired or contracted to the fabricator or manufacturer to design specialty elements, produce delegated design submittals and shop drawings to meet the requirements of the Authorities Having Jurisdiction; and who is registered in the province of British Columbia; and who is not the Consultant.

.2 Model Schedule S-B and Model Schedule S-C: Documents prepared by the delegated design professional engineer as recommended by APEGBC for submittal requirements meeting requirments of the Authorities Having Jurisdiction for the British Columbia Building Code (BCBC).

.3 Levels of Finish: Standard levels of finish defined by GA Manual apply to products of this Section as follows, and are used to designate required finish levels for indicated areas:

.1 Level 0: Not Used.
.2 Level 1: Embed tape at joints in ceiling plenum areas, concealed areas, unless a higher level of finish is required for fire resistance rated assemblies and sound rated assemblies.
.3 Level 2: Embed tape and apply separate first coat of joint compound to tape, fasteners, and trim flanges where panels are substrate for tile.
.4 Level 3: Not Used.
.5 Level 4: Embed tape and apply separate first, fill, and finish coats of joint compound to tape, fasteners, and trim flanges at panel surfaces that will be exposed to view. Provide Level 4 finish unless noted otherwise.
.6 Level 5: Embed tape and apply separate first, fill, and finish coats of joint compound to tape, fasteners, and trim flanges, and apply skim coat over entire surface for corridors, long hallways, walls, and ceilings having a length greater than 7500 mm or walls higher than 3600 mm.

.4 Refer to ASTM C11 for definitions of terms for gypsum board assemblies not defined in this Section or in other referenced standards.

1.4 Administrative Requirements

.1 Pre-Construction Meeting: Conduct a pre-construction meeting, to confirm surface preparation performed by this Section and required by Section 09 91 00 – Painting attended by the Construction Manager, Consultant, gypsum board Subcontractor and painting Subcontractor, and as follows:

.1 First Meeting: Confirm general acceptance of surfaces of gypsum board after completion of final taping and surface preparation performed by this Section, and before application of prime paint performed by Section 09 91 00 – Painting, with identification of any discrepancies that have potential to affect installation of specified paints and coatings.
.2 Second Meeting: Confirm any touch-ups to gypsum board deficiencies that become visible after application of prime paint and before application of finish coats, with repairs to installation issues being performed by this Section.
.3 Limitation of Meetings: Pre-construction meeting is needed to confirm installation discrepancies and deficiencies that only become apparent after application of painting and coating materials; repairs identified as being caused by impact or inattention by other subcontractors will be at the Construction Manager's expense, or as transferred to the responsible parties.

1.5 Submittals

.1 Action Submittals: Provide following submittals before starting any work of this Section:

.1 Shop Drawings: Submit shop drawings indicating locations, fabrication, and installation of control and expansion joints including plans, elevations, sections, details of components, and attachments to other parts of the Work.
.2 Product Data: Submit product data for each type of product specified.
.3 Alternative Products Submittals: Submit confirmation of fire-ratings or acoustical performance for products listed in this Section as Acceptable Alternative Products.
.4 Delegated Design Submittals: Submit the following:

.1 Engineered Shop Drawings: Submit shop drawings indicating details for anchorage and bracing for seismic restraint as required by the BCBC; sealed and signed by a professional engineer responsible for the design.
.2 Model Schedule S-B: Submit concurrently with Engineered Shop Drawings.
.3 Model Schedule S-C: Submit after completion of Site Reviews, immediately after completion of work required by this Section.

.2 Informational Submittals: Provide following submittals during the course of the Work:

.1 Suspended Ceiling Fastener Test Results: Submit test data indicating that fasteners and anchors used to suspend ceiling systems are sized and spaced appropriately based on suspension system manufacturer's requirements.
.2 Fire Ratings: Submit ULC Assembly Listings and Materials cut sheets for fire rated assemblies as follows:

.1 Not later than 30 working days following Award of Contract, submit copies of ULC Assembly and Materials Listing, Fire Resistance indicating ULC Number of assemblies used for work of this Section; indicate proof of compliance for rating criteria and assemblies listed on drawings meeting requirements of Appendix D-Division B of the British Columbia Building Code for review by the Consultant.
.2 ULC Listings indicated on Drawings indicate Basis-of-Design only and are not intended to provide a final solution; Substitutions will be considered for ULC Assemblies incorporating different manufacturer's materials and that are compliant with the Fire Ratings demonstrated by the listing indication on the Drawings.
.3 Use the same system and material as would be required for a tested assembly for the project; ULC Listings are tested with the specific materials indicated; substitutions will not be permitted unless evidence of equivalency is confirmed.

.4 Submit manufacturer's product data for materials and prefabricated devices, providing descriptions are sufficient for identification at job site; include manufacturer's printed instructions for installation.

.5 Submit manufacturer's engineered judgement for assemblies that are modified from published ULC Assembly and Materials Listings in accordance with Section 07 05 53 – Fire and Smoke Assembly Identification.

.3 Acoustic Ratings: Submit STC listings for assemblies based on manufacturer's testing and actual materials used for project; sound ratings of proposed assemblies are required to meet or exceed the acoustical performance listed on Drawings.

1.6 Delivery, Storage and Handling

.1 Delivery and Acceptance: Deliver materials in original packages, containers, or bundles bearing brand name and identification of manufacturer or supplier:

.1 Deliver gypsum board to site as near to the time of installation as possible.
.2 Protect gypsum board from damage during transportation using weather tight coverings.
.3 Remove shipping coverings once load is delivered and move to dry storage location.

.2 Storage and Handling: Store materials inside under cover and kept dry and protected against damage from weather, direct sunlight, surface contamination, corrosion, construction traffic, and other causes:

.1 Protect gypsum board from water, condensation, and other forms of moisture.
.2 Stack gypsum panels flat and on sufficient spacers to prevent sagging, and not in direct contact with floor surfaces.

.3 Protection from Mould and Mildew: Protect gypsum board from conditions that have probability of inoculating or causing mould growth during transportation and delivery, storage and handling, and installation in accordance with Gypsum Association GA-238.

1.7 Quality Assurance

.1 Regulatory Requirements: Fire-resistance ratings described on the Drawings and within this Section are based on material contributions listed in the Building Code; provide materials and construction identical to those described in the listed assemblies, or provide proof of performance as evidenced through an independent testing and inspection agency for materials that differ showing identical or better performance acceptable to the Authorities Having Jurisdiction as follows:

.1 Fire-Resistance Rated Assemblies: Provide submittals for assembly solutions using manufacturer's proprietary products that are different than those listed on the Drawings.
.2 Type-X Gypsum Board: Type-X gypsum board forms the basis for generic fire-resistance ratings described on the Drawings; Type-C gypsum board may be acceptable provided that proof of performance for listed fire-resistance ratings are submitted showing that products have been tested in accordance with listed standards and form assemblies described in ULC List of Equipment and Materials, Fire Resistance Ratings.

.2 Sound Transmission Characteristics: Sound ratings described on the Drawings and within this Section are based on generic material contributions listed in the Building Code and Gypsum Association GA 600, Fire Resistance Manual or the Building Code Fire and Sound Resistance Tables and Appendices; provide materials and construction identical to those described in the listed assemblies, or provide proof of acoustical performance using alternative proprietary products showing compliance with fire-resistance ratings and STC-ratings in accordance with ASTM E90 or Apparent Sound Transmission Class (ASTC-ratings) in accordance with Building Code, Section 5.8 Sound Transmission.

1.8 Site Conditions

.1 Ambient Conditions: Maintain room, surface, and material within temperature range and for duration before, during and after application in accordance with ASTM C840 and manufacturer's written requirements.

2. PRODUCTS

2.1 Manufacturers

.1 Acceptable Products Manufacturers: Subject to compliance with requirements specified in this Section, use any of the following listed manufacturers', provided required product data and shop drawing are submitted before starting any work of this Section:

.1 CertainTeed Gypsum of Canada
.2 CGC Interiors, A USG Company
.3 Georgia-Pacific Canada, Inc.

.2 Substitutions: Additional manufacturers offering similar products to Acceptable Products Manufacturers listed above may be incorporated into the work provided they meet the performance requirements established by the named products and provided they submit requests for substitution.

2.2 Performance Requirements

.1 Fire Test Response Characteristics: Refer to Section 07 05 53 – Fire and Smoke Assembly Identification; use materials identical to those listed for ULC assemblies submitted to Consultant.

.2 Mould Resistance: Gypsum Board tested in accordance with ASTM C1396/C1396M must have mould resistant facers meeting a rating of 8 or better, showing a maximum of 20% growth based on surface area coverage in accordance with ASTM D3273, except where zero mould growth moisture and mould resistant Products are specified below.

.3 Suspended Ceiling Fasteners: Provide fasteners having a minimum capacity of 890 N in tension for vertical loading conditions, a minimum capacity of 1960 N in tension and angular and bracing conditions, and as follows:

.1 Steel Roof Decking Anchors: Attachment of suspended ceiling systems directly to steel roof decking is not permitted.
.2 Steel Structure Fasteners and Steel Floor Deck Anchors: Provide attachment devices having five (5) times design load indicated in ASTM C635, Table 1, Direct Hung, having corrosion protection for severe service conditions, with holes or loops for attaching hangers having capacity to sustain ceiling loads as indicated in above, selected from one of the following types:

.1 Cast-in-place anchors.
.2 Post Installed expansion anchors.
.3 Chemical anchors.

.4 Seismic Response Characteristics: Design anchorages, ceiling suspension systems, ceiling and wall bracing and other structural components of non-structural assemblies and components in accordance with the BCBC, and as follows:

.1 Ceiling Anchorage, Bracing and Seismic Restraints: In addition to basic fastener requirements listed above, design suspension system to withstand seismic forces outlined in Building Code for normal facilities, based on a full uniform ceiling load acceleration of 0.246 g and velocity of 0.133 m/s in accordance with ASTM E580; ceilings areas less than 13 m² and surrounded by walls connected to structure above do not require seismic restraints.

.2 Maximum Deflection of Ceiling Components: Rigidly secure ceiling components including integral mechanical and electrical components with a maximum deflection of L/360 in accordance with ASTM E636.

.3 Partition Anchorage and Bracing: Rigidly support walls, partial height walls and wall ornamentation forming a part of partition assembly to resist lateral earthquake forces.

.5 Sound Transmission Characteristics: Provide materials and construction identical to those tested in assembly indicated according to ASTM E90 and classified according to ASTM E413 by a qualified independent testing agency for STC ratings of specific assemblies indicated on Drawings.

2.3 Suspended Ceiling Materials

.1 Suspended Gypsum Board Ceiling and Soffit Grid System: Manufacturer's gypsum board suspension grid system manufactured in accordance with ASTM C635 and ASTM C645, and as follows:

.1 Galvanizing: Metallic coatings in accordance with ASTM A653/A653M having Z275 minimum coating weight; or ASTM A792 having AZM180 minimum coating weight as standard to grid manufacturer.

.2 Module Sizes:

.1 Main Beams: Double web steel construction, minimum 0.45 mm thickness x 38 mm face flange width x nominal 43 mm high, having a knurled flange.

.2 Cross Tees: Double web steel construction, minimum 0.45 mm thickness x 38 mm face flange width x nominal 43 mm high and length to suit installation, having a knurled flange.

.3 Framing Angles: Steel construction, minimum 0.45 mm thickness x 32 mm x 32 mm with locking tabs and knurled surfaces.

.4 Transition Mouldings: Gypsum board to acoustical ceiling trims, pre-finished to match exposed Tees specified in Section 09 51 00 – Acoustical Panel Ceilings and having taping flange and 10 mm reveal.

.5 Ancillary Trims and Components: Manufacturer required furring channels, wall mouldings and edge trims, lighting trims, clips, adapters, and accessories required for complete installation.

.6 Screws and Fasteners: Bugle head screws in accordance with thickness of material used and the provisions of this Section.

.2 Profiled Edge Mouldings and Trim: Manufacturer's standard extruded aluminum or cold rolled steel edge mouldings and trims, including splice plates, corner pieces, gypsum board trim, attachments, and other clips, and as follows:

.1 Size: Nominal 100 mm high.

.2 Profile: Flat.

.3 Exposed Finish: Manufacturer's standard satin, white finish unless noted otherwise.

.4 Acceptable Products:

.1 Armstrong Axiom.

.2 CGC Compässo.

.3 Chicago Metallic Infinity Perimeter Trim.

.3 Suspended Gypsum Board Ceiling and Soffit Framed System: Provide components and materials in accordance with ASTM C754 for interior conditions as indicated on Drawings, and as follows:

.1 Tie Wire: In accordance with ASTM A641 Class 1 zinc coating, soft temper, No. 12 gauge wire.

.2 Hanger Attachments to Concrete: Anchors fabricated from corrosion resistant materials with holes or loops for attaching hanger wires and capable of sustaining, without failure, a load equal to five (5) times that imposed by construction as determined by testing according to ASTM E488/E488M by a qualified independent testing agency, type of any one as follows:

.1 Cast in place anchor, designed for attachment to concrete forms, coordinate with Construction Manager to confirm if this is possible.
.2 Post installed, chemical anchor.
.3 Post installed, expansion anchor.
.4 Powder Actuated Fasteners: Not allowed for this project.

.3 Ceiling Hangers:

.1 Wire Hangers: In accordance with ASTM A641, Class 1 zinc coating, soft temper, No. 8 gauge.
.2 Rod Hangers: In accordance with ASTM A510/A510M, mild carbon steel; 6 mm Ø minimum; ASTM A153/A153M, hot dip galvanized.
.3 Flat Hangers: Commercial steel sheet, conforming to ASTM A653/A653M, Z180, hot dip galvanized; 5 mm x 25 mm x length required.
.4 Angle Hangers: In accordance with ASTM A653/A653M, Z180, hot dip galvanized commercial steel sheet; 0.84 mm minimum; 42 mm x 42 mm minimum.

.4 Carrying Channels: Cold rolled, commercial steel sheet with a base metal thickness of 1.52 mm x 13 mm minimum wide flange, conforming to ASTM A653/A653M, Z180, hot dip galvanized zinc coating; 50 mm minimum depth.
.5 Furring Channels: Commercial steel sheet conforming to ASTM A653/A653M, Z180, hot dip galvanized zinc coating, as follows:

.1 Hat Shaped, Rigid Furring Channels: In accordance with ASTM C645, 0.84 mm thickness x 22 mm deep.
.2 Resilient Furring Channels: 13 mm deep members designed to reduce sound transmission having asymmetrical face attached to single flange by a slotted leg (web).

.4 Ceiling Attachment Devices: Provide anchors and fasteners sized and spaced in accordance with performance requirements indicated above and as required by manufacturer of ceiling suspension components and as follows:

.1 Rod and Flat Hangers: Mild steel, zinc coated.
.2 Angle Hangers: Minimum 22 mm x 22 mm x 1 mm thick angles, Z275 (G90) galvanized steel sheet in accordance with ASTM A653/A653M; bolted connections using 8 mm Ø bolts.

2.4 Non-Structural Partition Framing Materials

.1 Steel Partition Framing: Provide components and materials in accordance with ASTM C754, modified with CSSBI recommended wall height limitations for non-composite wall construction listed in Lightweight Steel Framing Architectural Design Guide for interior non-load bearing partitions and conditions indicated on Drawings, and as follows:

.1 Nominal Core metal thickness: Based on stud depth as indicated on drawings and as follows:

.1 Standard Assemblies up to 3.6 m high: Thickness based on L/240 with 360 Pa loading.
.2 Tall Assemblies greater than 3.6 m to a maximum of 4.8 m high: Thickness based on L/240 with 360 Pa loading
.3 Assemblies greater than 4.8 m high: Thickness based on L/240 with 480 Pa loading.

.2 Exceptions: Based on stud depth as indicated on drawings and as follows:

.1 Framing Supporting Fire Rated Doors and Frames: Use 0.80 mm nominal core metal thickness or greater as required by wall height.
.2 Framing Supporting Very High Impact Gypsum Board: Use 0.80 mm nominal core metal thickness or greater as required by wall height.

.2 Steel Sheet Components, Steel Studs and Runners: In accordance with ASTM C645 requirements for metal and ASTM A653/A653M, Z180, hot dip galvanized zinc coating and as follows:

.1 Runners: Width, nominal thickness, and galvanizing to match steel studs, and as follows:

.1 Slotted Deflection Track: Premanufactured slotted top runner with 63 mm down standing legs and having 6 mm wide x 38 mm high slots spaced at 25 mm O/C along length of runner; tested and certified for use in fire rated wall construction and have a ULC or cULus labelled assembly for fire rated assemblies:

- Acceptable Products:
  - Bailey Metal Products, Slotted Tracks.
  - Cemco, CST Slotted Track.
  - ClarkDietrich Metal Framing, MaxTrak.
  - SCAFCO, Slotted Track.
  - Steeler Inc., Slotted Track.

.2 Double Runner Deflection Track for Non-Rated Assemblies: Outside runner using 50 mm flanges; inner runner 33 mm; maintaining 25 mm minimum deflection space.

.3 Deep Leg Deflection Track for Non-Rated Assemblies: Top runner having 50 mm down standing legs; maintaining 13 mm minimum deflection space.

.4 Base Runner: Bottom track with 33 mm upstanding legs.

.2 Flat Strap and Backing Plate: Steel sheet for blocking and bracing in length and width indicated; 1.2 mm nominal base metal thickness x 406 mm wide.

.3 Horizontal Cross Bracing: 1.2 mm nominal base metal thickness; 13 mm minimum width flange x 38 mm minimum depth.

.4 Clip Angle: 38 mm x 38 mm x 1.8 mm nominal base metal thickness

.5 Furring Channels: Commercial steel sheet with ASTM A653/A653M, Z180, hot dip galvanized zinc coating, as follows:

.1 Hat Shaped, Rigid Furring Channels: ASTM C645, 0.84 mm thickness x 22 mm deep.

.2 Resilient Furring Channels: 0.46 mm thickness x 13 mm deep members designed to reduce sound transmission having asymmetrical face attached to single flange by a slotted leg (web).

.6 Fasteners for Metal Framing: Type, material, size, corrosion resistance, holding power, and other properties required to fasten steel members to substrates.

2.5 Structural Partition Framing Materials

.1 Heavy Gauge Interior Partition Framing: Steel stud framing for walls exceeding 2440 mm and having full height tile finish and walls exceeding 5000 mm in height, and as follows:

.1 Cold Formed Sheet Steel: Provide commercial steel sheet interior members; not forming a part of the exterior building envelope, conforming to ASTM A653/A653M, Z120, hot dip galvanized zinc coating, thickness of framing members exclusive of galvanized coating.

.2 Studs: Meeting requirements of CSA S136; identified for type, grade, and mechanical properties; minimum depth as indicated on Drawings x 38mm wide x metal core thickness 1.15 mm spaced at 610 mm on centre, hot dipped galvanized steel; roll formed with knurled flanges, services, and bracing cut outs.

.3 Track: Meeting requirements of CSA S136 having minimum metal core thickness 0.80 mm, hot dipped galvanized steel and as follows:

.1 Top track flanges of depth to suit vertical deflection; do not fix top of studs to track; width to suit studs; single top track system.

.2 Floor track to suit stud width, with 33 mm flanges.

.4 Channel Stiffener: 19 mm cold rolled channel of 1.2 mm, electro-galvanized steel.

.5 Fasteners:

.1 Stud-to-Stud: Steel, self drilling, self threading, case hardened.

- Material: stainless steel or steel with minimum 0.008 mm cadmium or zinc coating.
- Head Profile: hex, pan, and low profile type.
- Length: adequate to penetrate not less than 3 fully exposed threads beyond joined materials.

.2 Track-to-Steel: Secure track to structural steel over 8 mm thickness using Hilti DX fastening system with X-EDNI nails as specified. Provide additional steel back up above interstitial steel deck for wall support.

.3 Drilled Inserts: Steel, cadmium plated or hot dip galvanized, sizes as indicated on drawings.

.6 Bolts and Nuts: Meeting requirements of ASTM A307, with large flat type steel washers, sized to suit fasteners, hot dip galvanized, 413.68 MPa Tensile Strength

.7 Welding Electrodes: Minimum tensile strength series of 480 MPa, suitable for material being welded.

.8 Touch-Up Paint: Zinc rich, to CAN/CGSB-1.181.

2.6 Gypsum Board Materials

.1 Panel Sizes: Provide gypsum panels in maximum lengths and widths available that minimize joints in each area and correspond with support system as indicated on drawings, with long edges tapered and using thicknesses indicated on Drawings.

.2 Gypsum Core: Provide gypsum panels having gypsum core manufactured from recycled gypsum from post-industrial and post-consumer sources, and synthetic gypsum sourced from flue-gas desulphurization to the greatest extent possible to minimize use of natural (mined) gypsum.

.3 Gypsum Panels: Provide in maximum lengths and widths available that minimize joints in each area and correspond with support system as indicated on Drawings, in thicknesses as indicated and as follows:

.1 Fire Resistant Gypsum Board: Meeting requirements of ASTM C1396/C1396M and having maximum surface burning characteristics of FS-25/SD-5 in accordance with CAN/ULC S102, with long edges tapered; in thickness as indicated on Drawings, and as follows:

.1 Acceptable Products:

- CertainTeed, Easi-Lite Lightweight Gypsum Board.
- CGC, Sheetrock Ultralight Gypsum Panels.
- Georgia-Pacific, Lite-Weight Drywall.

.2 Sag Resistant Gypsum Board: Meeting requirements of ASTM C1396/C1396M, ceiling board manufactured to have more sag resistance than regular type gypsum board with long edges tapered; in thickness as indicated on Drawings, and as follows:

.1 Acceptable Products:

- CertainTeed, Easi-Lite Interior Ceiling Board.
- CGC Sheetrock, Ultralight Interior Ceiling Board.
- Georgia-Pacific, ToughRock Span 24 Ceiling Board.

2.7 Accessories

.1 Joint Tape: In accordance with ASTM C475/C475M, Type as recommended by gypsum board manufacturer for type of installation; use only mould resistant materials for mould and moisture resistant materials.

.2 Joint Treatment Materials: Provide joint compound and accessory materials in accordance with ASTM C475/C475M; for each coat use formulation that is compatible with other compounds applied on previous or for successive coats, and as follows:

.1 Pre-Filling: Setting type taping compound.

.2 Embedding and First Coat: Drying type compound.
.3 Fill Coat: Drying type compound.
.4 Finish Coat: Drying type, sandable topping compound.
.5 Skim Coat: Drying type, sandable topping compound.

.3 Joint Compound for Interior Mould and Moisture Resistant Gypsum Board: Provide joint compound and accessory materials in accordance with ASTM C475/C475M; for each coat use formulation that is compatible with other compounds applied on previous or for successive coats and as follows:

.1 Pre-Filling: Setting type joint compound.
.2 Embedding and First Coat: Setting type joint compound.
.3 Fill Coat: Setting type, sandable topping compound.
.4 Skim Coat: Setting type joint compound, sandable topping compound.
.5 Moulded Flute Inserts for Steel Decks: Preformed, single piece moulded mineral fibre flute inserts, sized for steel deck profiles, for placement at top of fire rated wall assemblies, and as follows:
.6 Basis-of-Design Products: Hilti CP777 Speed Plugs c/w Hilti CFS-SP WB Firestop Joint Spray.

.4 Top and Bottom of Gypsum Board Partition Inserts: Preformed, single piece polyurethane foam manufactured for placement between flat concrete slabs and gypsum board partitions and as follows:

.1 Basis-of-Design Products: Hilti CFS-TTS Firestop Top Track Seal.

.5 Fire Assembly Identification: Provide self-adhering labels or site stencilled and painted identification in accordance with Section 07 05 53 – Fire and Smoke Assembly Identification.

2.8 Acoustic Materials

.1 Coordinate placement of acoustic materials with wall assembly types.

.2 Acoustic Materials: Coordinate placement of acoustic materials with wall assembly types as follows:

.1 Acoustic Sealants for Fire Rated Assemblies: Use only fire rated materials as final seal in fire rated assemblies; apply acoustic sealants prior application of fire seals; fire seal materials are specified in Section 07 84 00 – Firestopping.
.2 Acoustic Sealants for Smoke Rated Assemblies: Lightweight low trigger resistance, non-sag, smooth surface finishing smoke and acoustic sealant in accordance with ASTM C834 and as follows:

.1 Basis-of-Design Product: Hilti CP-506 Smoke and Acoustic Sealant.

.3 Acoustic Sealant for Exposed Joints: Lightweight low trigger resistance, non-sag, paintable, non-staining, latex sealant in accordance with ASTM C834 that effectively reduces airborne sound transmission through perimeter joints and openings in building construction:

.1 Basis-of-Design Products: Pecora Corporation, AC-20 FTR (fire & temperature rated) Acoustic and Insulation Sealant.

.4 Acoustic Sealant for Concealed Joints: Lightweight low trigger resistance, non-drying, non-hardening, non-skinning, non-staining, gunnable, synthetic rubber sealant recommended for sealing interior concealed joints to reduce airborne sound transmission:

.1 Acceptable Products:

- Pecora Corporation, BA-98.
- Tremco, Acoustical Sealant.

.2 Foam Tape: Polyethylene foam gasket, 4.7 mm thickness x width of stud track and as follows:

.3 Basis-of-Design Products: Owens Corning Canada, ProPink ComfortSeal Sill Gasket.

.5 Acoustic Insulation for Fire and Smoke Rated Assemblies: Meeting the requirements of ULC S702.1 mineral fibre acoustic sound batts, Type 1 for all properties except thermal performance, width to friction fit steel studs; un-faced, thickness minimum 89 mm to fill a minimum of 90% of the cavity thickness, nominal density 40 kg/m3 minimum; STC ratings as indicated on drawings; having maximum flame spread and smoke developed of 20/20 in accordance with CAN/ULC S102 and being non-combustible in accordance with CAN/ULC S114:

.1 Acceptable Products:

- Johns Manville Sound Attenuation Fire Batts (SAFB).
- Owens Corning Canada, Thermafiber Fire & Sound Guard.
- ROCKWOOL, AFB.

.6 Acoustic Insulation for Non-Rated Assemblies: Meeting the requirements of ASTM C423, ASTM E90 and ASTM E413, and ULC S702.1 mineral fibre acoustic sound batts, Type 1 for all properties other than thermal, width to friction fit steel studs; un-faced, thickness as required to fill a minimum of 90% of the cavity thickness, nominal density 12.2 kg/m3 minimum; STC ratings as indicated on drawings:

.1 Acceptable Products:

- Owens Corning Canada, Quietzone Acoustical Batts.
- Johns Manville Sound Shield Glass Fibre Batts.

2.9 Auxiliary Materials

.1 Provide auxiliary materials in accordance with referenced installation standards and manufacturer's written recommendations, and as follows:

.1 Laminating Adhesive: Adhesive or joint compound recommended for directly adhering gypsum panels to continuous substrate.

.2 Steel Drill Screws: ASTM C1002, unless otherwise indicated, except use screws in accordance with ASTM C954 for fastening panels to steel members from 0.84 mm to 2.67 mm thickness, and as follows:

.1 Type S: Shallow pitch screw; used for single layer gypsum board application.
.2 Type G: Steep pitch screw; used for double layer gypsum board application.

.3 Isolation Strip at Exterior Walls: Adhesive backed, closed cell vinyl foam strips that allow fastener penetration without foam displacement, 3 mm thick, in width to suit steel stud size.

3. EXECUTION

3.1 Examination

.1 Verify that wall components and substrates; including welded hollow steel frames, cast in anchors and structural framing and other conditions affecting installation, are satisfactory before starting installation.

.1 Proceed with installation only after unsatisfactory conditions are corrected.

3.2 Preparation

.1 Mould Prevention: Do not install gypsum panels that are wet, that have been damaged by moisture, or that have evidence of mould growth such as fuzzy surfaces or dark splotchy surfaces and discolouration:

.1 Keep gypsum board dry throughout installation.

.2 Do not install gypsum board over other building materials where conditions exist that are favourable to mould growth.
.3 Install gypsum board installed on walls with a minimum 6 mm gap between bottom edge of panel and floor surface.

.2 Suspended Ceilings: Coordinate installation of ceiling suspension systems with installation of overhead structure and verify that inserts and other provisions for anchorages to building structure have been installed to receive ceiling hangers at spacing required to support ceilings and that hangers will develop their full strength and as follows:

.1 Provide inserts and other devises indicated to other trades for installation in advance of time needed for coordination and construction where concrete inserts are required.

.3 Foam Deck Inserts: Coordinate with fire resistive foam deck inserts, firestopping materials specified in Section 07 84 00 – Firestopping, and as follows:

.1 Install specified materials in accordance with material manufacturer's written instructions.

.4 Top and Bottom of Wall Fire Stops: Install top and bottom of wall fire stops concurrently with installation of steel stud tracks where partitions are in contact with fire resistive concrete slabs in accordance with fire stop material manufacturer's written instructions.

.5 Access Panels and Doors: Coordinate access panels and wall types with materials specified in Section 08 31 00 – Access Doors and Panels, and as follows:

.1 Coordinate with Mechanical and Electrical for locations and size requirements of access panels.
.2 Coordinate and confirm location of access panels before installation with Consultant.
.3 Install specified materials in accordance with material manufacturer's written instructions.

.6 Fire Rated Construction: Install materials forming a part of fire rated construction in accordance with manufacturer's instructions and as required by specific ULC listed construction requirements submitted by Subcontractor:

.1 Install fire rated gypsum wall panels vertically; horizontal installation does not meet testing standard unless horizontal blocking is installed behind horizontal joints.
.2 Install fire rated sealants after application of acoustic sealing materials, coordinate joint configuration with manufacturers ULC installation requirements.

.7 Cold Weather Application of Gypsum Board: Install gypsum board and joint compound in accordance with GA requirements and manufacturer's instructions, and as follows:

.1 Provide temporary heat and moisture control for a period sufficiently in advance of gypsum board and joint compound application to allow building and substrates to acclimate to installation temperature and moisture range required by manufacturer.
.2 Maintain temporary heat until permanent building heating system is started and continuously running.
.3 Provide suitable ventilation to allow materials to dry properly; prevent excessive air movement that could dry materials too quickly and that could cause shrinkage cracking.

3.3 Installation Of Ceiling Suspension Grid System And Steel Ceiling Framing

.1 Suspended Ceiling and Soffit Grid System and Steel Framing: Suspend ceiling hangers from building structure in Install ceiling suspension system in accordance with ASTM C636 and as follows:

.1 Install ceiling suspension systems requiring seismic restraint in accordance with ASTM E580.
.2 Install hangers plumb and free from contact with insulation or other objects within ceiling plenum that are not part of supporting structural or ceiling suspension system.

.3 Splay hangers only where required to miss obstructions and offset resulting horizontal forces by bracing, counter splaying, or other equally effective means.

.4 Install supplemental suspension members and hangers in form of trapezes or similar devices where width of ducts and other construction within ceiling plenum produces hanger spacing that interfere with the location of hangers required to support standard suspension system members.

.5 Size supplemental suspension members and hangers to support ceiling loads within performance limits established by referenced standards.

.6 Secure wire hangers by looping and wire tying, either directly to structures or to inserts, eye screws, or other devices and fasteners that are secure and appropriate for substrate, and in a manner that will not cause them to deteriorate or otherwise fail.

.7 Secure rod, flat or angle hangers to structure; including intermediate framing members, by attaching to inserts, eye screws, or other devices and fasteners that are secure and appropriate for structure and hanger, and in a manner that will not cause hangers to deteriorate or otherwise fail:

.1 Do not support ceilings directly from permanent metal forms, steel floor decking or other non-structural framing; fasten hangers to cast-in-place hanger inserts or drilled in anchors that extend through forms and steel floor decking into concrete.

.2 Do not attach hangers to steel deck tabs; do not attach hangers to steel roof decking; attach hangers to structural members or intermediate supports.

.3 Provide additional carrier channels between structural elements where structure does not align with hangers.

.4 Do not connect or suspend steel framing from ducts, pipes, or conduit.

.8 Install channel moulding or angle moulding to interface suspended gypsum board ceiling with adjacent construction; install gypsum board clip system to suspend second ceiling layer beneath first gypsum ceiling layer; use secondary framing cross tees to frame openings for light fixtures.

.9 Install pre-manufactured movement joints at locations shown on Drawings.

.10 Install main beams and cross tees at on centre spacing required for ceiling loading, and location of in-ceiling services; provide additional bracing as required by Authorities Having Jurisdiction.

.11 Install ceiling suspension components so members for panel attachment are level to within 3 mm in 3600 mm measured lengthwise on each member and transversely between parallel members.

.12 Wire-tie furring channels to supports; clips will not be acceptable.

.13 Install ceiling suspension components in sizes and spacing indicated, but not less than that required by manufacturer’s installation requirements.

.14 Install double row of resilient channels in sound and fire rated assemblies at long and short (butt) edges of gypsum board panels and provide a minimum of 38 mm from edge of panel to screw location; coordinate screw installation with other requirements of this Section.

3.4 Installation Of Steel Partition Framing

.1 Installation Standards: To ASTM C754, and ASTM C840 requirements that apply to framing installation.

.2 Install supplementary framing, blocking, and bracing at terminations in gypsum board assemblies to support fixtures, equipment services, heavy trim, grab bars, toilet accessories, furnishings, or similar construction in accordance with details indicated and with gypsum board manufacturer's written recommendations or, if non-available, with GA, Specification Standards Manual.

.3 Isolate steel framing from building structure at locations indicated to prevent transfer of loading imposed by structural movement, and as follows:

.1 Isolate ceiling assemblies where they abut or are penetrated by building structure.

.2 Isolate partition framing and wall furring where it abuts structure, except at floor.

.3 Install deflection track at head of assemblies that avoid axial loading of assembly and laterally support assembly, as follows:

.1 Non-rated Assemblies: Install double runner deflection track.
.2 Fire Rated Assemblies: Install slotted deflection track.

.4 Do not bridge building control and expansion joints with steel framing or furring members. Frame both sides of joints independently.

.5 Installing Steel Partition Framing: Install tracks (runners) at floors, ceilings, and structural walls and columns where gypsum board assemblies abut other construction:

.1 Install foam gasket isolation strip between studs where studs are installed directly against exterior walls.
.2 Fasten to concrete with expansion anchors, shielded screws not exceeding 600 mm O/C. Do not use powder activated fasteners.
.3 Install each steel framing and furring member so fastening surfaces vary not more than 3 mm from the plane formed by the faces of adjacent framing.
.4 Extend partition framing full height to structural supports or substrates above suspended ceilings, except where partitions are indicated to terminate at suspended ceilings. Continue framing over frames for doors and openings and frame around ducts penetrating partitions above ceiling to provide support for gypsum board:

.1 Cut studs 13 mm short of full height to provide perimeter relief.
.2 Install framing around structural and other members extending below floor slabs and roof decks, as needed to support gypsum board closures and to make partitions continuous from floor to underside of solid structure for fire resistance rated and STC rated partitions that extend to the underside of floor slabs and roof decks or other continuous solid structure surfaces.
.3 Terminate partition framing at suspended ceilings where indicated.

.5 Install steel studs so flanges point in the same direction and leading edge, or end of each panel can be attached to open (unsupported) edges of stud flanges first.
.6 Install horizontal cross bracing to steel studs at 1220 mm O/C vertically for the entire length of wall for unbraced walls exceeding 3660 mm in length.
.7 Frame door openings using 0.84 mm steel studs and in accordance with gypsum board manufacturer's applicable written recommendations:

.1 Screw vertical studs at jambs to jamb anchor clips on door frame; install runner track section (for cripple studs) at head and secure to jamb studs.
.2 Install two studs at each jamb, connected for entire length.
.3 Extend jamb studs through suspended ceilings and attach to underside of floor or roof structure above.

.8 Frame openings other than door openings the same as required for door openings. Install framing below sills of openings to match framing required above door heads.
.9 Install double row of resilient channels in sound and fire rated assemblies at long and short (butt) edges of gypsum board panels and provide a minimum of 38 mm from edge of panel to screw location; coordinate screw installation with other requirements of this Section.

3.5 Installation Of Joints and Trims

.1 Form control joints to account for thermal movements, to account for movement where direction of framing changes direction, and movements arising differing substrate materials using V-Shaped trims by framing back-to-back framing members and a break in gypsum panel at a maximum of 7.5 metres O/C, as follows:

.1 Install control joints in wall and ceiling construction in accordance with ASTM C840, so that gross area enclosed by joints does not exceed 80 m2 between joints using limiting distances as follows:

.1 Interior Partitions: 9.0 metres maximum single dimension.
.2 Interior Ceilings with Perimeter Relief: 15 metres maximum single dimension.
.3 Interior Ceilings without Perimeter Relief: 9.0 metres maximum single dimension.

.2 Lay out control joints to coincide as far as possible with door, window, or screen frames, but not necessarily to occur at every individual frame; install control joints vertically and horizontally from corners of openings.
.3 Install additional control joints at locations required for architectural or design accents as indicated on Drawings.
.4 Provide continuous dust barrier behind joints.
.5 Install joints straight and true.
.6 Form control joints to meet sound rated construction and fire ratings required for remainder of wall or ceiling construction.
.7 Obtain Consultant's acceptance of control joint layout before starting installation of materials specified in this Section.

.2 Form expansion joints to account for building movements using back-to-back framing members and edge trims, and a break in gypsum panel over structural movement joints and floor slab control joints as follows:

.1 Install expansion joints incorporating continuous air and vapour membranes and with sufficient gap to allow for projected building movements.
.2 Seal back-to-back edge bead control joints with clear silicone sealant as specified in Section 07 92 00 – Joint Sealants.
.3 Provide continuous dust barrier behind joints.
.4 Install joints straight and true.
.5 Form expansion joints to meet sound rated construction and fire ratings required for remainder of wall or ceiling construction.

3.6 Installation Of Panels

.1 Gypsum Board Application and Finishing Standards: To ASTM C840 and generally at the following locations and as indicated on Drawings:

.1 Regular Type: Vertical surfaces not subject to wetting
.2 Fire Resistant Type: Where required for fire resistance rated assemblies; fire resistant description can modify any of the following gypsum board types
.3 Sag Resistant Type: Overhead and horizontal surfaces not subject to wetting
.4 Mould and Moisture Resistant Type: Vertical and horizontal surfaces subject to wetting
.5 Abuse Resistant Type: As indicated on Drawings.
.6 Tile Backing Type: Where required for surfaces receiving tile or other surface finishes.
.7 Acoustic Type: Acoustically rated assemblies.

.2 Panel Application Methods: Install in accordance with referenced standards and as follows:

.1 Single Layer Application:

.1 On ceilings, apply gypsum panels before wall/partition board application to the greatest extent possible and at right angles to framing.
.2 On partitions, apply gypsum panels vertically (parallel to framing), unless horizontal application is indicated or otherwise required by fire resistance rated assembly, and to minimize end joints.
.3 Stagger abutting end joints not less than one framing member in alternate courses of board.
.4 At stairwells and other high walls, install panels horizontally, unless otherwise indicated or required by fire resistance rated assembly.
.5 Apply gypsum panels to supports using Type S screws fastened 10 mm from edges of board.
.6 Apply gypsum board to assemblies having resilient channels using Type S screws fastened 38mm edges of boards, coordinate with installation of resilient channels.

.2 Double Layer Application:

.1 Apply first layer with enough screws to hold panel in place.
.2 Stagger and offset joints of second layer from first layer.

.3 Apply second layer over first layer and secure as specified for single layer application using screws long enough to penetrate both layers and penetrate 10 mm into metal framing.

.4 Apply gypsum board to assemblies having resilient channels as follows:

- Base Layer: Using Type S screws fastened 38 mm from long edges of board and 10 mm from short edges of board.
- Face Layer: Using Type G screws fastened 38 mm from long and short edges of board; offset face layer so that joints do not line up with base layer.
- Coordinate with installation of resilient channels.

.3 Install sound attenuation blankets before installing gypsum panels unless blankets are readily installed after panels have been installed on one side.

.4 Install ceiling board panels across framing to minimize the number of abutting end joints and to avoid abutting end joints in the central area of each ceiling; stagger abutting end joints of adjacent panels not less than one framing member spacing.

.5 Install gypsum panels with face side out; butt panels together for a light contact at edges and ends with not more than 1.5 mm of open space between panels; do not force into place.

.6 Locate edge and end joints over supports:

.1 Do not place tapered edges against cut edges or ends.
.2 Stagger vertical joints on opposite sides of partitions.
.3 Do not make joints other than control joints at corners of framed openings.
.4 Stop gypsum board away from underside of floor above and roof deck to allow for deflection of structure.
.5 Attach gypsum board to vertical studs, not to ceiling track, to allow for deflection.

.7 Attach gypsum panels to steel studs so leading edge or end of each panel is attached to open (unsupported) edges of stud flanges first.

.8 Attach gypsum panels to framing provided at openings and cut outs.

.9 Cover both faces of steel stud partition framing with gypsum panels in concealed spaces (above ceilings, etc.), except in chases braced internally:

.1 Unless concealed application is indicated or required for sound, fire, air, or smoke ratings, coverage may be accomplished with scraps of not less than 0.7 m2 in area.
.2 Fit gypsum panels around ducts, pipes, and conduits.
.3 Cut gypsum panels to fit profile formed by coffers, joists, and other structural members where partitions intersect open concrete coffers, concrete joists, and other structural members projecting below underside of floor/roof slabs and decks; allow 6 mm to 10 mm wide joints to install sealant.

.10 Isolate perimeter of non-load bearing gypsum board partitions at structural abutments, except floors. Provide 6 mm to 13 mm wide spaces at these locations, and trim edges with J-bead edge trim where edges of gypsum panels are exposed. Seal joints between edges and abutting structural surfaces with acoustic sealant.

.11 Space fasteners in gypsum panels according to referenced gypsum board application and finishing standard and manufacturer's written recommendations, and as follows:

.1 Space screws a maximum of 300 mm o/c for vertical applications.
.2 Space fasteners in panels that are tile substrates a maximum of 200 mm o/c.

.12 Install fire rated and labelled gypsum board at all locations indicated on Drawings; continue fire and smoke rated wall construction behind and around fire hose cabinet recesses and other recessed items larger than a double gang switch box to maintain wall fire rating. Place self-adhering labels or applied stencils indicating fire-rated rating assembly in accordance with Section 07 05 53 – Fire and Smoke Assembly Identification.

.13 Install sheet metal wall backing continuously where reinforcement is required for wall hung accessories and assemblies and as follows:

.1 Butt joints between adjoining metal sheets.
.2 Form sheet metal extending 150 mm on each side of wall and ceiling corners without joints where metal backing is continuous around corners.
.3 Spot glue first gypsum board layer at 150 mm o/c to metal backing to hold in place before mechanically fastening surface layer of gypsum board in a two layer installation.

.14 Install gypsum board laminated to concrete or concrete masonry substrates, where required for the project, using adhesive system recommended by gypsum board manufacturer.

.15 Tile Backing Panels:

.1 Install standard gypsum board panels in areas not subject to wetting to produce a flat surface.
.2 Install water resistant/mould resistant gypsum board in all washrooms and housekeeping rooms.
.3 Construct shower partitions of cementitious backer board or glass mat reinforced water resistant gypsum backing board only, in strict accordance with manufacturer's current recommended installation procedures.
.4 Shim surfaces to produce a uniform plane across panel surfaces where tile backing panels abut other types of panels in the same plane.

.16 Finishing Gypsum Board Assemblies:

.1 Treat gypsum board joints, interior angles, edge trim, control joints, penetrations, fastener heads, surface defects, and elsewhere as required to prepare gypsum board surfaces for decoration. Promptly remove residual joint compound from adjacent surfaces.
.2 Pre-fill open joints, rounded or bevelled edges, and damaged surface areas.
.3 Apply joint tape over gypsum board joints, except those with trim having flanges not intended for tape.
.4 Gypsum Board Finish Levels: Finish panels to levels indicated on Drawings and as specified, according to defined criteria.
.5 Water Resistant and Mould Resistant Gypsum Board: Do not tape or fill joints in water resistant mould resistant gypsum board used as a substrate for ceramic tile.

3.7 Installation Of Acoustic Components

.1 STC Rated Assemblies: Seal construction at perimeters, behind control and expansion joints, and at openings and penetrations with a continuous bead of acoustic sealant. Install acoustic sealant at both faces of partitions at perimeters and through penetrations. In accordance with ASTM C919 and manufacturer's written recommendations for locating edge trim and closing off sound flanking paths around or through gypsum board assemblies, including sealing partitions above acoustic ceilings.

.2 Acoustic Sealants: Seal sound rated partitions in strict in accordance with gypsum board manufacturer's instructions for the specific sound rating requirements. Provide four (4) beads of sealant where no sealants are indicated; one under each inner and outer layer of gypsum board and as follows:

.1 Locate sealant so that it is covered at completion of partition when finishes applied; use appropriate sealant for exposed locations.

.2 Seal around mechanical and electrical work and other work in walls to achieve proper sound ratings.
.3 Provide gaskets where partitions abut a finished surface or material and where partitions meet exterior wall furring.
.4 Build in all doors and borrowed light frames and equipment to provide a neat, cleanly finished system.
.5 Construct fire rated partitions using firestopping sealant applied subsequent to installation of acoustic sealant beads to maintain required sound ratings and fire performance requirements applied to both sides of partition or penetration.
.6 Construct zero hour rated smoke separations similarly as non-fire rated partitions using multiple beads of acoustical sealant materials with a final layer of smoke rated acoustical sealant applied to one side of partition or penetration that replaces one conventional bead of acoustical sealant.

.3 Acoustic Sound Batts:

.1 Install acoustic sound batts within metal stud space and above suspended gypsum board ceilings as indicated for sound or fire rating.
.2 Acoustic sound batts to extend full height of partitions.
.3 Fill behind electrical outlet boxes, fire hose cabinets, washroom accessories and other openings with at least 150 mm lap around perimeter of opening; do not compress acoustic sound batts as this could cause the gypsum board finish to bulge or push outward.
.4 Coordinate with Electrical and Mechanical Subcontractors and verify that no back-to-back openings are formed, whether or not so indicated on drawings.
.5 Installation to in accordance with manufacturer's current written recommendations.

3.8 Installation Of Fire Rating Sealants

.1 Seal fire rated partitions strictly in accordance with fire sealant manufacturer’s instructions for specific fire rating requirements listed; coordinate with
Section 07 84 00 – Firestopping.

.2 Locate sealant so that it is covered at completion of partition when finishes applied.

.3 Seal around mechanical and electrical work and other work in wall to maintain proper fire rating.

3.9 Installation Of Access Panels

.1 Install access panels in wall assemblies to maintain fire rating of assembly.

.2 Confirm location of access panels with the Consultant before installation.

.3 Minor adjustments to location within wall system may be required where panel interferes with architectural appearance.

3.10 Installation Of Trim Accessories

.1 For trim with back flanges intended for fasteners, attach to framing with same fasteners used for panels. Otherwise, attach trim according to manufacturer's written instructions.

.2 Control Joints: Install control joints at locations indicated on Drawings, confirm locations of joints with Consultant before construction, and in accordance with ASTM C840 and in specific locations approved by Consultant for visual effect where joints are not otherwise indicated.

3.11 Site Quality Control

.1 Above Ceiling Observation: Before installing gypsum board ceilings, Consultant will conduct an above ceiling observation and report deficiencies in the Work observed. Do not proceed with installation of gypsum board to ceiling support framing until deficiencies have been corrected:

.1 Notify Consultant seven (7) working days in advance of date and time when Project, or part of Project, will be ready for above ceiling observation.

.2 Before notifying Consultant, complete the following in areas to receive gypsum board ceilings:

.1 Installation of 80% of lighting fixtures, powered for operation.
.2 Installation, insulation, and leak and pressure testing of water piping systems.
.3 Installation of air duct systems.
.4 Installation of air devices.
.5 Installation of mechanical system control air tubing.
.6 Installation of ceiling support framing.

.2 Non-Conforming Work: Remove and replace fasteners and anchors that test results indicate do not comply with specified requirements; additional testing will be performed to determine compliance with specified requirements where fasteners and anchors are removed and replaced.

3.12 Closeout Activities

.1 Cleaning: Clean exposed surfaces of acoustic panel ceilings, including trim, edge mouldings, and suspension system members in accordance with manufacturer's instructions.

.2 Repairing: Touch-up minor damage to finishes in accordance with manufacturer's instructions; remove and replace ceiling components that cannot be successfully cleaned and repaired.

END OF SECTION

1. GENERAL

1.1 Summary

.1 This Section includes requirements for labour, materials, tools and other equipment, services and supervision required for surface preparation and site painting of exposed exterior and interior items and surfaces to the requirements of the Master Painter's Institute (MPI) Specifications Manual.

.2 Surface preparation, priming, and finish coats specified in this Section are in addition to shop priming and surface treatment specified in other Sections, and as follows:

.1 Surface preparation of substrates includes cleaning, small crack repair, patching, caulking, and making good surfaces and areas.
.2 Surface preparation and prime painting surfaces for wall coverings before installation in accordance with wall covering manufacturer's recommended preparation requirements.
.3 Prime painting and back-priming of surfaces except where pre-primed with an MPI approved primer under other Sections of work.

.3 Paint exposed and semi-exposed items and surfaces, except where Specifications indicate that the surface or material is not painted or is to remain natural, and as follows:

.1 Paint item or surface same as similar adjacent materials or surfaces where item or surface is not specifically mentioned.
.2 Consultant will select from standard colours and finishes available where a colour of finish is not indicated.
.3 Painting includes site painting of exposed bare and covered conduit, pipes and ducts including colour coding, hangers, exposed steel and iron supports, and surfaces of mechanical and electrical equipment that do not have a factory applied final finish
.4 Painting of semi-concealed areas such as inside of light troughs and valances, behind grilles, and projecting edges above and below sight lines
.5 Floating Ceilings: Paint walls for full height above floating ceiling.
.6 Stencil painting of patterns, lines, letters, or symbols indicated on Drawings.
.7 Painting and finishing of exposed to view elevator equipment and components including doors and door frames unless pre-finished.
.8 Painting of exposed to view mechanical heating, ventilating and plumbing services, and equipment such as ducts, sprinkler piping, and electrical work to extent specified unless prefinished.
.9 Provision of safe and adequate ventilation as required over and above temporary ventilation supplied by Construction Manager, where toxic, volatile, or flammable materials are being used.
.10 Touch-ups and site painting necessary to complete work shown, scheduled, or specified.

1.2 Related Requirements

.1 Other sections of the specification requiring painting refer to this section. Coordinate requirements of referencing sections including but not limited to the sections listed below.

1.3 Reference Standards

.1 American Society for Testing Materials (ASTM International):

.1 ASTM D16-19, Standard Terminology for Paint, Related Coatings, Materials, and Applications
.2 ASTM E84-21a, Standard Test Method for Surface Burning Characteristics of Building Materials
.3 ASTM F1869-16a, Standard Test Method for Measuring Moisture Vapor Emission Rate of Concrete Subfloor Using Anhydrous Calcium Chloride

.2 Canadian Standards Association (CSA Group):

.1 CSA A23.1:19/A23.2:19, Concrete Materials and Methods of Concrete Construction

.3 Canadian General Standards Board (CGSB):

.1 CGSB 1 Series of Standards contained in the MPI Manual Description of Products, for products forming a part of the specified systems
.2 CAN/CGSB 85.10-99, Protective Coatings for Metals
.3 CAN/CGSB 85.100-93, Painting

.4 The Master Painters Institute (MPI):

.1 New Surfaces: Architectural Painting Specification Manual

.5 The Society for Protective Coatings (SSPC):

.1 Coating Materials Guidelines
.2 Surface Preparation Guidelines
.3 Application, Inspection and Quality Control Guidelines

1.4 Definitions

.1 Gloss Levels: Standard coating terms defined by MPI Manual apply to products of this Section as follows to designate required gloss levels for indicated areas:

.1 G1 – Matte or Flat: Lustreless or matte finish with a gloss range below 10 when measured at 85° to meter and 0 to 5 when measured at 60°.
.2 G2 – Velvet: Matte to low sheen finishes with a gloss range of 10 to 35 when measured at 85° to meter and 0 to 10 when measured at 60°.
.3 G3 – Eggshell: Low sheen finish with a gloss range of 10 to 35 when measured at 85° to meter and 10 to 25 when measured at 60°.
.4 G4 – Satin: Low to medium sheen with a gloss range of minimum 35 when measured at 85° to meter and 20 to 35 when measured at 60°.
.5 G5 – Semi-Gloss: Medium sheen finish with a gloss range of 35 to 70 when measured at 60° to meter.

.2 Service Areas: Rooms or areas dedicated to fire suppression, plumbing, heating, and ventilation, building integration systems, electrical and communications equipment including the following:

.1 Mechanical Rooms and Closets.
.2 Electrical Rooms and Closets.
.3 Telecommunications Rooms and Closets.
.4 Penthouses and Enclosures.
.5 Other rooms or areas containing equipment and systems that provides services to the building.
.6 Exterior areas with exposed pipe, ductwork or conduit providing services to the building.

.3 Unfinished Items and Surfaces: Do not paint prefinished items, concealed surfaces (except for back-priming), finished metal surfaces, operating parts, including the following:

.1 Prefinished Items: May include the following factory finished components:

.1 Architectural woodwork.
.2 Acoustical wall panels.
.3 Metal toilet enclosures.
.4 Metal lockers.
.5 Unit kitchens.
.6 Elevator entrance doors and frames.
.7 Elevator equipment.

.8 Finished mechanical and electrical equipment.
.9 Light fixtures.

.2 Concealed Surfaces: May include walls or ceilings in the following areas considered as inaccessible spaces:

.1 Foundation spaces.
.2 Furred areas.
.3 Ceiling plenums.
.4 Pipe spaces.
.5 Duct shafts.
.6 Elevator shafts.

.3 Finished Metal Surfaces: May include the following:

.1 Anodized aluminum.
.2 Stainless steel.
.3 Chromium plate.
.4 Copper and copper alloys.
.5 Bronze and brass.

.4 Operating Parts: May include moving parts of operating equipment and the following:

.1 Valve and damper operators.
.2 Linkages.
.3 Sensing devices.
.4 Motor and fan shafts.

.5 Mechanical Ducts or Pipes: May include the following:

.1 PVC or aluminum clad insulated pipes or ducts.

.6 Labels: May include the following:

.1 ULC, CSA or other code required labels.
.2 Equipment name, identification, performance rating, or nomenclature plates.

1.5 Administrative Requirements

.1 Coordination: Coordinate requirements of this Section with other components of the Work of the Project as follows:

.1 Condition of Substrates: Coordinate correction of defects and deficiencies in substrates that may adversely affect painting work, except for minimal work specified in this section and preparation of surfaces to receive paint and finishes under this section of work, with trades responsible for installation of deficient substrates:

.1 Review other Sections in which primers are provided to ensure compatibility of the total system for various substrates.
.2 Provide information to work of other Sections about characteristics of finish materials to ensure use of compatible primers when requested.

.2 Coordination with Other Coating Systems: Coordinate with other coating systems such as intumescent fireproofing coatings, high build coatings and similar materials, and account of work performed by this Section with products specified in other coating specification Sections.

.3 Non-Architecturally Exposed Structural Steel Surface Preparation: Coordinate surface preparation and shop priming of non-architecturally exposed structural steel, steel deck, and metal fabrications, metal doors, frames and windows including fittings as specified under those respective sections for type of primer forming a part of the painting system specified in this section and as follows:

.1 Specification sections having steel or metal components requiring applied finishes will prime steel with coatings specified in this section.
.2 Touch-up primer and apply finish coatings specified for steel or metal components.

.3 Failure to coordinate correct shop priming of steel construction will result in the Consultant giving instructions for removal of shop applied primer, and the Construction Manager assessing costs to the responsible trades.

.4 Wood Surface Preparation and Finishing: Coordinate requirements for site finishing finished carpentry items as follows:

.1 Back prime wood assemblies before installation in final location
.2 Mask and protect adjacent areas from over sprayed or splashed materials of this section
.3 Maintain dust free environment in area of site painting wood assemblies

.5 Mechanical and Electrical Finishing: Coordinate requirements for painting and identification of mechanical piping and ducting, and electrical conduits with trades responsible for that part of the work as follows:

.1 Obtain quantity or length of materials requiring applied finishes, and identify which colour is required on each surface from mechanical or electrical contractor.
.2 Prepare surfaces and apply coating systems specified, in colours required for each surface.
.3 Mechanical and electrical contractors will be responsible for application of secondary markings and identification labels.

.2 Pre-Installation Conference: Conduct conference at Project site, attended by the Construction Manager's personnel, the Consultant including mechanical and electrical engineers, the mechanical and electrical Subcontractor, and the painting Subcontractor to discuss:

.1 Mechanical and electrical painting.
.2 Special surface effects.
.3 Coordination of work with work of other Sections.
.4 Protection of finishes.
.5 Acceptability of substrates.
.6 Quality of materials being used for the project.

.3 Scheduling: Schedule painting work before installation of miscellaneous hardware, surface fittings, fastenings, fixtures, and trim by other paint applicators including the hanging of doors and installation of door hardware:

.1 Remove, store, and reinstall items that have been installed before start of work of this Section.
.2 Schedule work of this Section with the Construction Manager to allow for:

.1 Disruption of work of this section by other trades
.2 Disruption of work to other trades by this section

.3 Schedule phased work with the Construction Manager.
.4 Do not apply final coat of paint until Consultant has had the opportunity to review and adjust tint under actual lighting conditions.

1.6 Submittals

.1 Action Submittals: Provide the following submittals before starting any work of this Section:

.1 Product Data: Submit list of all painting materials used for the Work to the Consultant for review prior to ordering materials for each paint system indicated, including block fillers and primers:

.1 Material List: An inclusive list of required coating materials indicating each material and cross reference specific coating, finish system, and application; identify each material by manufacturer's catalogue number and classification.
.2 Base Information: Confirmation of manufacturer's ability to supply paint in a variety of base tints, specific to the range of colours being used on this project; indicate colour of base tint used and amount of colourant added to establish Scheduled colours.

.3 Manufacturer's Information: Manufacturer's technical information, including label analysis and instructions for handling, storing, and applying each coating material.

.2 Samples: Provide stepped samples, defining each separate coat, including block fillers and primers using representative colours required for the project; label each sample for location and application, and as follows:

.1 Samples for Initial Selection: Provide samples for each type of finish coat material specified; Consultant will provide colour chips for surfaces being coated after colour selection.

.2 Drawdown Samples: Provide three (3) drawdown sample charts (cards) for each type, texture and colour of finish specified for verification purposes before ordering paint materials:

- Apply paint sample in layers to Opacity Charts, by The Leneta Company until paint colour appearance over black and white areas is identical, or the specified level of opacity for translucent products has been achieved.
- Apply paint to Opacity-Display Charts in an even coat as soon as possible after mixing; apply enough layers to make painted area completely opaque, or to the required level of opacity for translucent products.
- Order paint only for drawdown cards accepted by Consultant.
- Final colour selection is by Consultant.
- Resubmit until accepted by Consultant.
- Consultant will provide colour chips if alternate colours are selected for rejected cards.

.3 Samples for Verification: When requested by the Consultant, provide samples for each colour and material, with texture to simulate actual conditions, on representative samples of the actual substrate as follows:

- Concrete: 100 mm square samples for each colour and finish.
- Concrete Unit Masonry: 100 mm square samples of masonry, with mortar joint in the centre, for each finish and colour.
- Ferrous Metal: 100 mm square or 200 mm long samples of flat metal for each colour and finish.
- Painted Wood: 200 mm long or square samples for each colour and material on representative sample wood used for the Work.
- Stained or Natural Wood: 200 mm long or square samples of natural or stained wood finish on representative species of wood used for the Work.
- Painted Gypsum Board: 200 mm long or square samples for each colour and material.

.2 Informational Submittals: Provide the following submittals when requested by the Consultant:

.1 Certification: Submit certification reports for paint products indicating that they meet or exceed low VOC and coloured base requirements listed in this Section.

.2 Purchase Orders: Retain purchase orders, invoices, and other documents for verification of compliance with specification and design requirements.

1.7 Project Closeout Submissions

.1 Operation and Maintenance Data: Submit copies of paint manufacturer's written maintenance information for inclusion in the operations manual including specific warning of any maintenance practice or materials that may damage or disfigure the finished Work.

.2 Maintenance Materials: Deliver maintenance materials to Owner in quantities indicated that match products installed; packaged with protective covering for storage, and identified with labels describing contents and building location and as follows:

.1 Paints and Coatings: Minimum of four (4)-4L containers of field colours and four (4)-1 L containers of each accent colour, and all remnants.

1.8 Quality Assurance

.1 Qualifications: Provide proof of qualifications when requested by Consultant:

.1 Applicator: Use a firm or individual experienced in applying paints and coatings similar in material, design, and extent to those indicated for this Project, whose work has resulted in applications with a record of successful in service performance, and as follows:

.1 Having a minimum of three (3) years proven satisfactory experience; show proof of qualifications when requested by Consultant.
.2 Provide a list of the last three comparable jobs including, name and location, specifying authority, start and completion dates and cost amount of the painting work when requested.
.3 Use only qualified journeymen who have a Tradesman Qualification Certificate of Proficiency for painting and decorating work.
.4 Apprentices may be employed provided they work under the direct supervision of a qualified journeyman in accordance with trade regulations.

.2 Supplier: Obtain block fillers and primers for each coating system from the same manufacturer as the finish coats and as follows:

.1 Use only paint manufacturers and products as listed under the Approved Products section of the MPI Manual Architectural Painting Specification Manual.
.2 Use only paint manufacturers and products as listed under the Approved Products section of the MPI Manual Architectural Painting Specification Manual as modified by performance requirements listed in this Section.

1.9 Delivery, Storage And Handling

.1 Delivery and Acceptance: Deliver materials to Project site in manufacturer's original, unopened packages and containers bearing manufacturer's name and label and the following information:

.1 Product name or title of material.
.2 Product description (generic classification or binder type).
.3 Manufacturer's stock number and date of manufacture.
.4 Contents by volume, for pigment and vehicle constituents.
.5 Thinning instructions.
.6 Application instructions.
.7 Colour name and number.
.8 VOC content and sustainable labelling agency identified.

.2 Storage and Handling: Store materials not in use in tightly covered containers in a well-ventilated area at a minimum ambient temperature of 7°C, in accordance with the following:

.1 Maintain storage containers in a clean condition, free of foreign materials and residue.
.2 Protect from freezing.
.3 Keep storage area neat and orderly.
.4 Remove oily rags and waste daily.
.5 Maintain toxic, volatile, explosive, or flammable materials in a safe environment:

.1 Provide adequate fireproof storage lockers for solvents, drop clothes, rags, and other flammable materials.
.2 Post warning signs, such as NO SMOKING, NO OPEN FLAMES.
.3 Prevent the release of volatile organic compounds (VOC) into the atmosphere.
.4 Prevent fire hazards and spontaneous combustion.
.5 Prevent hazardous spills.
.6 Store materials that constitute a fire hazard (paints, solvents, and drop clothes, etcetera) in suitable closed and rated containers and removed from the site on a daily basis.
.7 Comply with requirements of authorities having jurisdiction concerning the use, handling, storage, and disposal of hazardous materials.

.6 Provide one (1) 9 kg ABC fire extinguisher with all temporary heating equipment, and in close proximity to where paint and coating materials are being stored.

1.10 Site Conditions

.1 Ambient Conditions: Maintain relative humidity at less than 85%, temperatures at least 3°C above dew point, and as follows:

.1 Temperature: Maintain temperature of surfaces and surrounding air between the following temperatures for a minimum of 24 hours before, during and after application or until paints and coatings are fully cured, whichever is greater:

.1 Waterborne paints and coatings: 10° to 32°C.
.2 Solvent thinned paints and coatings: 7° to 35°C.
.3 Maintain temperatures during application and until materials are fully cured.

.2 Surfaces Conditions:

.1 Maintain surfaces free from snow, rain, fog, or mist, dampness or wetness that could impair bond; painting may continue during inclement weather if surfaces and areas are enclosed and heated within temperature limits specified above in this Section during application and drying periods.
.2 Maintain surfaces at less than maximum moisture content indicated below; test wood and plaster surfaces using a properly calibrated electronic moisture meter:

.1 Concrete and Masonry: 12% maximum moisture content when tested in accordance with ASTM F1869.
.2 Wood: 15% maximum moisture content.
.3 Plaster and Gypsum Board: 12% maximum moisture content.

2. PRODUCTS

2.1 Manufacturers

.1 Basis-of-Design Products: Manufacturers listed as additional Acceptable Products and that offer similar products may be incorporated into the work of this Section, provided they meet the performance requirements established by the named products.

.2 Additional Acceptable Products Manufacturers: Subject to compliance with requirements specified in this Section, use any of the following listed manufacturers' products provided required product data and shop drawing are submitted before starting any work of this Section:

.1 Benjamin Moore and Co. Limited.
.2 Cloverdale Industrial Protective Coatings.
.3 Dulux Paints.
.4 Para Paints.
.5 PPG Canada Inc., Architectural Finishes.
.6 SICO Inc.
.7 Sherwin-Williams LLC.

.3 Substitutions: Additional manufacturers offering similar products to Acceptable Products Manufacturers listed above may be incorporated into the work provided they meet the performance requirements established by the named products and provided they submit requests for substitution.

2.2 Performance Requirements

.1 Proprietary Colour Codes: Colour and colour matching is a performance requirement for the project and will be administered as follows:

.1 Use of manufacturer's proprietary colour codes is not intended to imply that listed manufacturer are used to the exclusion of products of other manufacturers listed as Acceptable Products within this Section, or MPI Approved Product listing where Acceptable Products listing is not included.
.2 Tinting by other named manufacturers listed as Acceptable Products or within the MPI Approved Product listing is permitted.

.2 Quality of Materials: Use only manufacturer's top-line or premium series products when multiple listings from the same manufacturer occur within MPI Approved Product Categories and specific Acceptable Products are not included under the scheduled MPI Architectural Systems Listings in this Section; paint material containers not displaying manufacturer's product identification will not be acceptable:

.1 Provide materials from the same manufacturer within the specified MPI Architectural Systems or Acceptable Products listings.
.2 Provide materials (primers, paints, coatings, varnishes, stains, lacquers, fillers, thinners, solvents) in accordance with the MPI Approved Product listing, as a minimum; include additional requirements of this Section for base tint and colourant limitations.
.3 Provide other materials (linseed oil, shellac, thinners) not specifically listed of the highest quality product of an approved manufacturer listed in the MPI Manual and that are compatible with other coating materials.

.3 Environmental Performance: Listing of Acceptable Products and manufacturers in this Section is based on product listings that have provided proof of the following performance requirements for paints and coating systems:

.4 Use only paints and coatings that have low or ultra-low VOC content tint bases and colourants to the greatest extent possible, and as follows:

.1 Materials must not be formulated or manufactured with formaldehyde, halogenated or aromatic solvents, and heavy metals such as mercury, lead, cadmium, and chromium.
.2 Materials must have a flash point of 61.0°C or greater.
.3 Paints and coatings must not contain VOC's in excess of limits required by sustainable design requirements.
.4 Use paint materials that have good flowing and brushing properties, and that dry or cure free of blemishes or sags.
.5 Use paint bases that require no more than 90 grams/L of colourant to achieve the scheduled colours; manufacturers that offer ultra low or no VOC content colourants will be given preference.
.6 Use paint bases that when combined with colourant do not exceed 100 g/L VOC; no exceptions where VOC compliance requirements are provided in this Section.
.7 Paints that readily scuff, burnish, varnish or oxidize on contact after manufacturer's recommended curing period will not be acceptable for use on this project.

.5 Material Compatibility: Provide block fillers, primers, and finish coat materials that are compatible with one another and with substrates required for conditions of service and application, as demonstrated by manufacturer based on testing and site experience:

.1 Use paint materials that have good flowing and brushing properties, and that dry or cure free of blemishes or sags.
.2 Provide paints and coatings that meet flame spread and smoke developed ratings designated by local Code requirements and Authority Having Jurisdiction.

2.3 Equipment

.1 Painting and Decorating Equipment:

.1 Use decorating equipment that meets or exceeds best trade standards for type of product and application.

.2 Use spray painting equipment of capacity suited to the type and consistency of paint or coating being applied; kept clean and in good working order.

2.4 Mixing And Tinting

.1 Colours: Match colours listed in Section 09 06 00 – Schedules for Finishes.

.2 Multiple Paint Base Tints: Use only paint systems that offer multiple tint bases that minimize addition of colourants; transparent bases will not be accepted as an acceptable tint base where manufacturer listings within the MPI Approved Products listing have multiple listings.

.3 Mixing: Provide ready mixed paints; re-mix paints immediately prior to and during application to maintain colour and gloss uniformity:

.1 Mix paste, powder or catalyzed paints or coatings in strict accordance with manufacturer's written instructions.
.2 Perform all colour tinting operations before delivery to site; limit amount of colourant added to base tint as indicated in this Section.
.3 Add thinner, where allowed by manufacturer, of type and quantity in accordance with paint manufacturer's recommendations.

3. EXECUTION

3.1 Condition Of Surfaces

.1 Apply paint only to dry, clean, properly cured and adequately prepared surfaces in areas where dust is no longer generated by construction activities such that airborne particles will not affect the quality of finished surfaces.

.2 Thoroughly examine and test substrates for conditions adversely affecting application of coatings prior to commencement of work of this section:

.1 Report in writing to the Construction Manager indicating measures required to correct affected work of this section, and informing other Sections responsible for the condition of substrates of requirements for correcting defects and deficiencies:

.1 Notify responsible substrate trade contract installer of conditions that become apparent after application of first coat of paint requiring corrective action.
.2 Starting of finish painting of defective surfaces, such as gypsum board, will indicate acceptance of substrate and costs of repairing defects will be borne by the paint applicator of this Section including repainting of entire defective surface; touch-up painting will not be allowed.

.2 Proceed with paint application only after unsatisfactory conditions have been corrected and surfaces receiving paint are thoroughly dry.
.3 Notify Consultant about anticipated problems when using the materials specified over substrates primed by others.
.4 Start of painting will be construed as acceptance of surfaces and conditions within a particular area.

3.2 Preparation Of Surfaces

.1 Provide a minimum lighting level of 325 Lux on surfaces where paint or coatings are being applied; and supply temporary heat and ventilation, scaffolding and platforms, and housekeeping services as required to complete the work of this Section, and as follows:

.1 Maintain adequate continuous ventilation and sufficient heating facilities to maintain ambient air and substrate temperatures as indicated above in this Section.
.2 Provide supplemental ventilating and heating equipment if existing system is inadequate to meet minimum requirements.

.2 Prepare substrate surfaces in accordance with MPI Manual requirements including but not limited to remaining items listed in this article.

.3 Remove hardware and hardware accessories, plates, machined surfaces, lighting fixtures, and similar items already installed that are not to be painted:

.1 Provide surface applied protection before surface preparation and painting where removal is impractical or impossible because of size or weight of the item.
.2 Reinstall items removed using workers skilled in the trades involved after completing painting operations in each space or area.

.4 Remove oil and grease then clean substrates of substances that could impair bond of the various coatings before applying paint or other surface treatments:

.1 Schedule cleaning and painting so dust and other contaminants from the cleaning process will not fall on wet, newly painted surfaces.
.2 Clean and prepare surfaces according to manufacturer's written instructions for each particular substrate condition and as specified.
.3 Prepare concrete floors to CSA A23.1/A23.2.

.5 Provide barrier coats over incompatible primers or remove and re-prime substrate where paint applicator for this Section failed to coordinate use of MPI Manual recommended primers and surface preparation techniques.

.6 Prepare concrete, concrete unit masonry and other porous cementitious materials by removing efflorescence, chalk, dust, dirt, grease, oils, and release agents; roughen as required to remove glaze; mechanically remove hardeners or sealers used to improve curing; use solvent or mechanical cleaning methods that comply with SSPC recommendations appropriate to surface and exposure location:

.1 Use abrasive blast cleaning methods if recommended by paint manufacturer.
.2 Determine alkalinity and moisture content of surfaces by performing appropriate tests. If surfaces are sufficiently alkaline to cause the finish paint to blister and burn, correct this condition before application.
.3 Do not paint surfaces if moisture content exceeds that permitted in manufacturer's written instructions.
.4 Clean concrete floors with a 5% solution of muriatic acid or other etching cleaner; flush floor with clean water to remove acid, neutralize with ammonia, rinse, and allow to dry, vacuum before painting.

.7 Clean wood surfaces of dirt, oil, and other foreign substances with scrapers, mineral spirits, and sandpaper, as required and as follows:

.1 Sand surfaces exposed to view smooth and dust off.
.2 Scrape and clean small, dry, seasoned knots, and apply a thin coat of white shellac or other recommended knot sealer before applying primer.
.3 After priming, fill holes and imperfections in finish surfaces with putty or plastic wood filler, sand smooth when dried.
.4 Prime, stain, or seal wood to be painted immediately on delivery.
.5 Prime edges, ends, faces, undersides, and back sides of wood, including cabinets, counters, cases, and paneling.
.6 Back prime with spar varnish where transparent finish is required.
.7 Back prime paneling on interior partitions where masonry, plaster, or other wet wall construction occurs on back side.

.8 Clean ungalvanized ferrous metal surfaces that have not been shop coated; remove oil, grease, dirt, loose mill scale, and other foreign substances using solvent or mechanical cleaning methods that comply with SSPC recommendations appropriate to surface and exposure location:

.1 Blast steel surfaces clean as recommended by paint system manufacturer.

.2 Treat bare and sandblasted or pickled clean metal with a metal treatment wash coat before priming.
.3 Touch up bare areas and shop applied prime coats that have been damaged; wire brush, clean with solvents recommended by paint manufacturer, and touch up with same primer as shop coat.

.9 Clean galvanized surfaces with non-petroleum based solvents so surface is free of oil and surface contaminants, mechanically remove pre-treatment materials from galvanized sheet metal fabricated from coil stock.

.10 Mix and prepare paint materials according to manufacturer's written instructions:

.1 Maintain containers used in mixing and applying paint in a clean condition, free of foreign materials and residue.
.2 Stir material before application to produce a mixture of uniform density.
.3 Stir as required during application to maintain consistent tint density.
.4 Do not stir surface film into material, remove surface film and strain material before using.
.5 Use only thinners approved by paint manufacturer and only within recommended limits.
.6 Tint each undercoat a lighter shade to simplify identification of each coat when multiple coats of same material are applied.
.7 Tint undercoats to match the colour of the finish coat; but provide sufficient differences in shade of undercoats to distinguish each separate coat.

.11 Protect adjacent surfaces and areas from painting operations and damage by drop cloths, shields, masking, templates, or other suitable protective means.

.12 Correct, refinish, or replace any damage caused by failure to provide adequate protection to adjacent surfaces.

.13 Sand, clean, dry, etch, neutralize, or test all surfaces using adequate illumination, ventilation, and temperature requirements in accordance with manufacturer’s written instructions and the MPI Manual.

3.3 Application

.1 Apply paint according to manufacturer's written instructions, use applicators and techniques best suited for substrate and type of material being applied, and in accordance with MPI Manual Premium Grade finish requirements, except where additional requirements have been specified.

.2 Do not paint over dirt, rust, scale, grease, moisture, scuffed surfaces, or conditions detrimental to formation of a durable paint film.

.3 Provide finish coats that are compatible with primers used.

.4 The term exposed surfaces includes areas visible when permanent or built-in fixtures, grilles, convector covers, covers for finned-tube radiation, and similar components are in place; extend coatings in these areas as required, to maintain system integrity and provide desired protection, and as follows:

.1 Paint surfaces behind movable equipment and furniture the same as similar exposed surfaces.
.2 Paint surfaces behind permanently fixed equipment or furniture with prime coat only before final installation of equipment.
.3 Paint interior surfaces of ducts with a flat, non-specular black paint where visible through registers or grilles.
.4 Paint back sides of access panels and removable or hinged covers to match exposed surfaces.
.5 Finish exterior doors on tops, bottoms, and side edges the same as exterior faces.
.6 Finish interior of wall and base cabinets and similar site-finished casework to match exterior.

.7 Sand lightly between each succeeding coating of enamel or varnish.

.5 Apply first coat to surfaces that have been cleaned, pre-treated, or otherwise prepared for painting as soon as practicable after preparation and before subsequent surface deterioration, and as follows:

.1 Apply paint and coatings within an appropriate time frame after cleaning where environmental conditions encourage flash rusting, rusting, contamination, or the manufacturer's paint specifications require earlier applications.
.2 The number of coats and film thickness required are the same regardless of application method, except that dark tinted colours will require a minimum of four (4) coats with an additional clear urethane or water based light industrial type of coating applied in high traffic areas.
.3 Do not apply succeeding coats until previous coat has cured as recommended by manufacturer.
.4 If sanding is required to produce a smooth, even surface according to manufacturer's written instructions, sand between applications.
.5 Omit primer over metal surfaces that have been shop primed and touch-up painted.
.6 Apply additional coats until paint film is of uniform finish, colour, and appearance if undercoats, stains, or other conditions show through final coat of paint, giving special attention to ensure that edges, corners, crevices, welds, and exposed fasteners receive a dry film thickness equivalent to that of flat surfaces.
.7 Allow sufficient time between successive coats to permit proper drying.
.8 Do not recoat surfaces until paint has dried to where it feels firm and does not deform or feel sticky under moderate thumb pressure, and until application of another coat of paint does not cause undercoat to lift or lose adhesion.

.6 Apply paints and coatings by brush, roller, spray, or other application methods according to manufacturer's written instructions and as follows:

.1 Application methods:

.1 Brushes: Use brushes best suited for type of material applied. Use brush of appropriate size for surface or item being painted.
.2 Rollers: Use rollers of carpet, velvet-back, or high-pile sheep's wool as recommended by manufacturer for material and texture required.
.3 Spray Equipment: Use airless spray equipment with orifice size as recommended by manufacturer for material and texture required and as follows:

- Apply paint using brush or roller unless Consultant has given written acceptance for use of spray equipment and methods.
- The Consultant may at any time prohibit the use of spray painting for such reasons as carelessness, poor masking, or protective measures, drifting paint fog, disturbance to other trades or failure to obtain a dense, even, opaque finish
- Back roll sprayed surface progressively.

.2 Apply paint materials no thinner than manufacturer's recommended spreading rate to achieve dry film thickness recommended by the manufacturer.
.3 Sand and dust between each coat to provide an anchor for next coat and to remove defects visible from a distance up to 1220 mm.

.7 Hollow Metal Doors and Frames: Sand to remove blemishes and fill surface dimples, prime using coating compatible with finishes.

3.4 Mechanical and Electrical Paint Application

.1 Painting of mechanical and electrical work, including hangers and supports is limited to items exposed in service areas.

.2 Paint mechanical items including the following:

.1 Un-insulated metal piping; interior and exterior.
.2 Un-insulated plastic piping; interior and exterior.
.3 Pipe hangers and supports, interior and exterior.
.4 Tanks that do not have factory-applied final finish.
.5 Visible portions of internal surfaces of metal ducts without liner, behind air inlets and outlets
.6 Duct, equipment, and pipe insulation having paintable service jacket or other paintable jacket material; do not paint PVC or aluminum clad insulated ducts.
.7 Mechanical equipment that is indicated to have a factory primed finish for site painting which may include the following:

.1 Exterior items: Louvers and grilles, air handling units, mechanical ductwork, metal chimney stacks, goosenecks, roof jacks and roof vents.
.2 Interior items: Un-insulated valves, valve handles, boilers, fan guards, heat exchangers, cold fluid tanks, hot fluid tanks, integral pump bases, water chiller units, pumps, brine tanks, air handling units and plenums.

.8 Painting and colour coding is required on substrates in colours as listed in Division 20 – Mechanical Support for system identification.

.3 Paint electrical items including the following:

.1 Switchgear.
.2 Panel boards.
.3 Electrical Conduit and cable; interior and exterior
.4 Electrical equipment which is required to be prefinished in coded colours in accordance with electrical colour coding requirements specified in Division 26 – Electrical.
.5 Painting and colour coding is required on substrates in colours as listed in Division 26 – Electrical for system identification.

.4 Locations:

.1 Painting and colour coding is required at locations specified below in this Section, on substrates and by methods indicated.
.2 Exposed in Services Areas: Includes but is not limited to, rooms and areas containing equipment relating to mechanical systems, sprinkler systems, electrical systems, boiler and heating systems, air handling systems, and similar rooms
.3 Exposed in Finished Areas: Includes all other rooms not listed above; mechanical and electrical work will be left exposed as an architectural feature in areas where there are no ceilings.
.4 Semi-Concealed Spaces: Includes all non-exposed but accessible spaces behind ceilings, walls, and floors, including exposed spaces that will be semi-concealed at some future time.
.5 Permanently Concealed Spaces: Includes all non-exposed and permanently inaccessible spaces behind ceilings, walls, and floors, including exposed spaces which will be permanently concealed at some future time.
.6 Exposed to Exterior: Includes all exposed exterior locations

.5 Methods:

.1 Painting and colour coding by methods specified below, are required on substrates and at locations indicated in **Error! Reference source not found.**.
.2 Method P1 Full Colour Coding for Mechanical Piping and Equipment:

.1 Primary Colour Coding: Paint substrates in their entirety in required primary colour for each type of service in accordance with Colour Coding Requirements. Use applicable 3 coat finish system.

.3 Method P2 Intermittent Colour Coding for Mechanical Piping:

.1 Paint System: Use one coat semi-gloss enamel or machinery enamel, suitable for type of substrate and surface temperature.
.2 Primary Colour Coding: Apply paint in required primary colours for each type of service in accordance with Colour Coding Requirements specified in Division 22 – Mechanical Systems Identification.

.4 Method P3 Full Painting in Un-coded Colours:

.1 Paint substrates in their entirety. Use applicable 3 coat finish system.
.2 Except as otherwise specified below, make colours the same as wall or ceiling background colours.
.3 Where interior mechanical and electrical work will be left exposed as an architectural feature, for bidding purposes, colour scheme will include a maximum of 2 colours with approximately 50% deep colour tones, excluding colours for mechanical piping which require primary colour coding as specified under Method P1.
.4 Where exterior mechanical and electrical work requires painting, for bidding purposes, colour scheme will include a maximum of 2 colours with approximately 50% deep colour tones, excluding colours for mechanical piping which require primary colour coding as specified under Method P1.

.5 Method P4 No Painting and Colour Coding:

.1 Painting and colour coding are not required.

.6 Paint natural gas piping painted yellow in interior and exterior locations; whether concealed, semi-concealed or exposed; do not apply other colour applied to gas piping, except as stated for banding identification only or where piping is pre-coloured.

3.5 Closeout Activities

.1 Restoration: Clean and re-install all hardware items that were removed before painting operations were undertaken, ensuring that tagged or labelled items are returned to the exact position from which they were removed and as follows:

.1 Clean, prime and re-paint all bolts, nuts, and fasteners after torqueing or re-tightening following specified paint finish
.2 Remove protective coverings and warning signs as soon as possible after operations cease.
.3 Protect freshly painted surfaces from paint droppings and dust to approval of Consultant. Avoid scuffing newly applied paint.
.4 Restore areas used for storage, cleaning, mixing, and handling of paint to clean condition as approved by Consultant.

.2 Cleaning: Perform final cleaning as follows:

.1 Remove all paint where spilled, splashed, splattered, or sprayed as work progresses using means and materials that are not detrimental to affected surfaces.
.2 Keep work area free from an unnecessary accumulation of tools, equipment, surplus materials, and debris.
.3 Remove combustible rubbish materials and empty paint cans each day and safely dispose of it in accordance with requirements of authorities having jurisdiction.
.4 Clean equipment and dispose of wash water or solvents, and other cleaning and protective materials (rags, drop cloths, masking papers, and etcetera), paints, thinners, paint removers and strippers in accordance with the safety requirements of authorities having jurisdiction.

.3 Protecting: Protect newly painted exterior surfaces from rain and snow, condensation, contamination, dust, salt spray and freezing temperatures until paint coatings are completely dry and as follows:

.1 Allow for curing periods that exceed 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.

3.6 Exterior Paint Schedule

.1 Paint exterior surfaces in accordance with the MPI Manual painting systems listed in this section.

.2 EXT 5.3 – Galvanized Metal (Doors, Frames, Railings, Misc. Steel, Pipes, Overhead Decking, Eavestroughs (gutters), Downpipes, Ducts, Etc.):

.1 EXT 5.3C – Epoxy (over epoxy primer) (High Contact/Traffic)
.2 EXT 5.3H – Latex (over w.b. galvanized primer) (Low Contact/Traffic).

3.7 Interior Paint Schedule

.1 Paint interior surfaces in accordance with the MPI Manual painting systems listed in this section.

.2 INT 5.3 – Galvanized Metal (Doors, Frames, Railings, Pipes, Over-Head Decking, Pipes, Ducts, Etc.):

.1 INT 5.3M – High Performance Architectural Latex (over w.b. galvanized primer).

.3 INT 9.2 – Plaster and Gypsum Board (Gypsum Wallboard, Drywall, "Sheet Rock" Type Material, and Texture Finishes, Etc.):

.1 INT 9.2M – Institutional Low Odour/VOC (over w.b. primer sealer, low VOC primer).

END OF SECTION

Pontem Group
Unit 309 – 63 West 6th Avenue
Vancouver, BC V5Y 1K2

WHISTLER MUNICIPAL HALL

4325 Blackcomb Way, Whistler, BC

ALTERNATIVE SOLUTION REPORT

Report No.: PG210173
Issued For: Issued for Building Permit Submission

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Permit to Practice: #1000529

TABLE OF CONTENTS

1 EXECUTIVE SUMMARY

The Whistler Municipal Hall is an existing 3-level City Hall located at 4325 Blackcomb Way, Whistler, BC. To increase the level of fire and life safety in the building, 5 mitigating features are proposed.

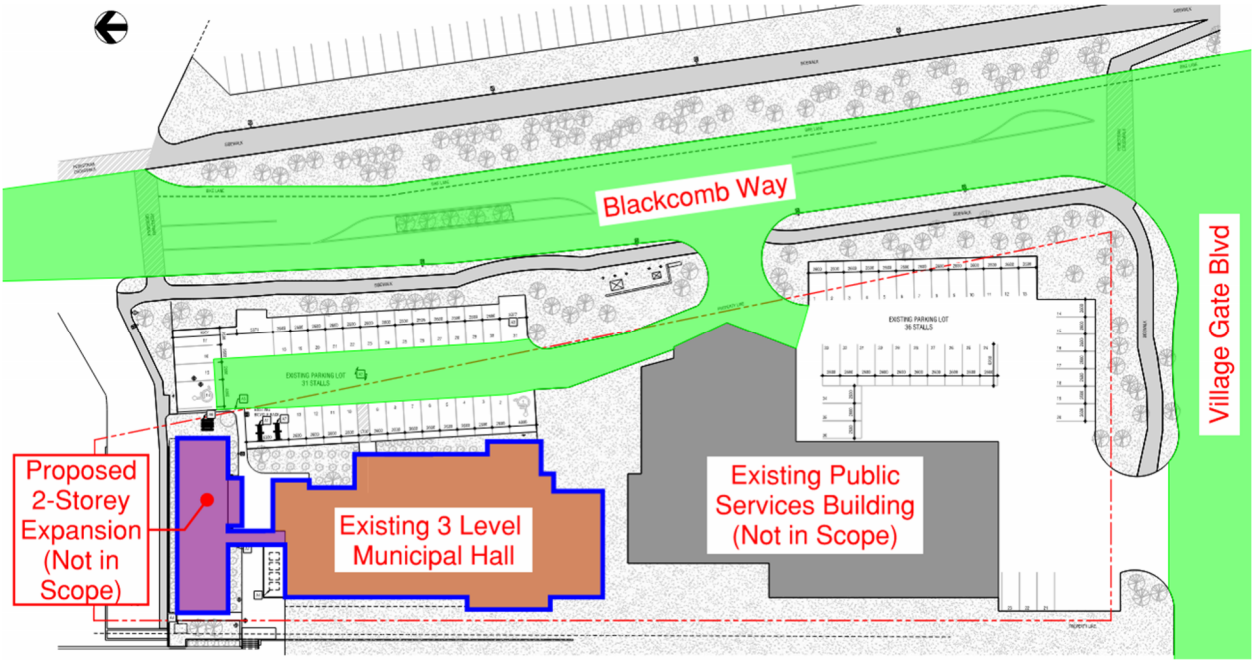


Figure 1: Site Plan

1.1 APPLICABLE CODE

The applicable Building Code for this project is 2018 British Columbia Building Code (BCBC).

1.2 SCOPE OF REPORT

Pontem Consulting Group Ltd. has been retained by the Resort Municipality of Whistler to provide an alternative solution for the project. This report is based on the information provided by S2 Architecture. It identifies the fire and life safety requirements with Division B, Part 3 of the BCBC. Any references indicated in the report are to the BCBC unless otherwise stated. Information related to the overall existing municipal hall mentioned in this report is based on record document forwarded to Pontem Group. It is not the scope of Pontem Group to assess every aspect of the entire existing municipal hall nor identify existing code deficiencies of the existing building. It is the building owner's responsibilities to follow the governing building code at the time of construction.

1.2.1 PREVIOUSLY ACCEPTED EQUIVALENCIES

There may be existing building code equivalencies that have been accepted by the City during previous construction of the municipal hall. The proposed expansion work will not involve extensive alterations to the existing building. Therefore, it is expected that the proposed municipal hall addition will not alter any previously accepted equivalencies and the existing standard of fire and life safety. All new work will be reviewed in conformance with the 2018 BCBC. Any new work which does not conform with the BCBC will be addressed by alternative solutions.

1.3 LIMITATION OF LIABILITY

This document is prepared by Pontem Consulting Group Ltd. (Pontem Group). The content contained in this document represents Pontem Group's best assessment based on the information available at the time of preparation. Pontem Group accepts no responsibility, if any, suffered by any third party as a result of the use of any content of this report without authorization from Pontem Group. Pontem Group shall not be held responsible for any content stated in this report without written acceptance by the applicable Authority Having Jurisdiction. As this document is not a design document, it is the responsibility of the registered professionals of record to incorporate building code measures described in this report, including alternative solutions, into the design, building permit and construction documents.

2 ALTERNATIVE SOLUTION: FIRE AND LIFE SAFETY UPGRADE

To improve the level of fire and life safety in the original municipal hall, several protective measures are proposed throughout the building, which include the following:

1. 45 Minute Floor Separation: Level 3 office glazing to be replaced with wired glass.

2. Sprinkler Protecting Levels 1, 2, and 3: Sprinklers will be installed on Levels 1, 2, and 3 of the original municipal hall to improve the existing roof rating and address the current exit arrangement on Level 3.

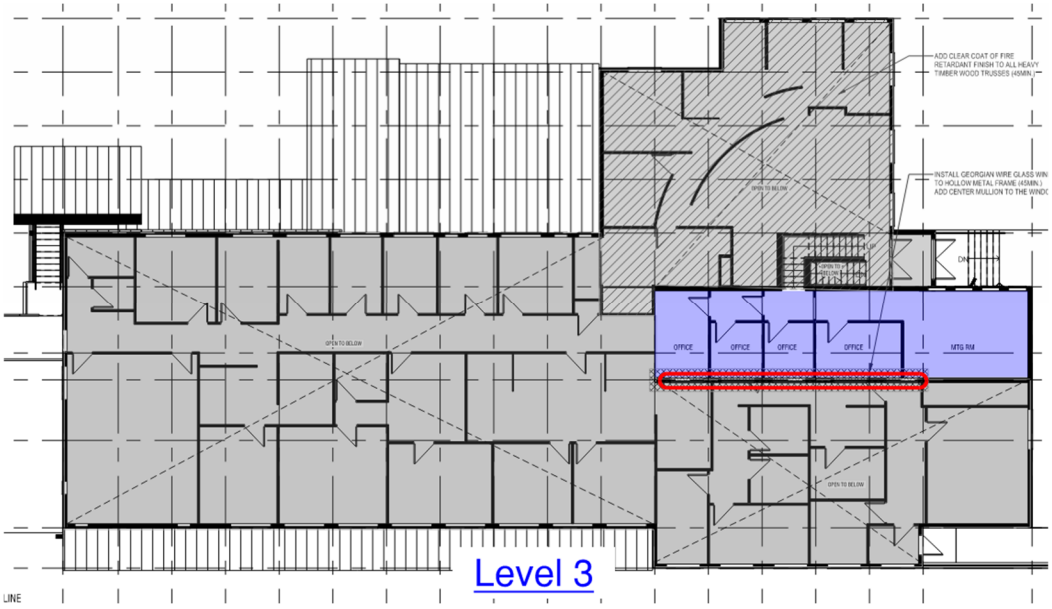
3. Spatial Separation: A water curtain will be installed along the interior of the west exterior wall, supplemented by the addition of non-combustible cladding to improved fire protection.

4. Protection of Exit Facilities: A water curtain will be installed on the interior side of the unprotected opening, which exposes the north external stairway and south accessible entrance ramp.

2.1 MITIGATING FEATURE: 45 MINUTE FIRE SEPARATION

2.1.1 CODE REQUIREMENTS

There is existing glazing that connect Level 3 offices to the space below on Level 2. As such, the required 45 min floor separation between Levels 2 and 3 is currently incomplete. Wired glass, which is permitted in a fire separation with up to 1 h fire-resistance rating, is proposed to replace the existing glazing to meet code compliance.



Legend	Note
	Existing glazing to be replaced by wired glass
	Level 3 office area
	Area open to Level 2 below

Figure 2: Level 3 Proposed Wired Glass Location

3.1.8.16.(1) Wired Glass and Glass Block

Except as permitted by Articles 3.1.8.18. and 3.1.8.19. for the separation of exits, an opening in a fire separation having a fire-resistance rating not more than 1 h is permitted to be protected with fixed wired glass assemblies or glass blocks installed in conformance with NFPA 80, “Fire Doors and Other Opening Protectives.”

2.1.2 MAINTENANCE REQUIREMENTS

Field reviews will be conducted to confirm that the alternative solution will be implemented during construction. The protection measure is passive protection and there are no specific maintenance requirements, but it will be part of the general building maintenance arrangement.

2.2 MITIGATING FEATURE: SPRINKLER PROTECTING LEVELS 1, 2, AND 3 OF THE ORIGINAL MUNCIPAL HALL

2.2.1 CODE REQUIREMENTS

According to the code, the expanded municipal hall can remain under Construction Article 3.2.2.60. and may remain without sprinklers; however, the roof must have a 45-minute fire resistance rating. This alternative solution is provided to enhance the fire safety of the original municipal hall's roof and further safeguard the current exit arrangement on Level 3.

2.2.2 OBJECTIVES AND FUNCTIONAL STATEMENTS

Clause 3.2.2.60.(2)(c) establishes the roof construction of the building. Since it is proposed to enhance the fire safety of the original municipal hall's roof to further safeguard the current exit arrangement on Level 3, the objectives and functional statements outlined in Clause 3.2.2.60.(2)(c) will be addressed. The objective and functional statements are as follows:

[F04-OS1.3]
[F04-OP1.3]

OS1	Objectives
Fire Safety	An objective of this Code is to limit the probability that, as a result of the design or construction of the building, a person in or adjacent to the building will be exposed to an unacceptable risk of injury due to fire. The risks of injury due to fire addressed in this Code are those caused by:
OS1.3	Collapse of physical elements due to a fire or explosion

OP1	Objectives
Fire Protection of the Building	An objective of this Code is to limit the probability that, as a result of its design or construction, the building will be exposed to an unacceptable risk of damage due to fire. The risks of damage due to fire addressed in this Code are those caused by:
OP1.3	Collapse of physical elements due to a fire or explosion

	Functional Statements
F04	To retard failure or collapse due to the effects of fire.

2.2.3 INTENT STATEMENTS

The intent statements are as follows:

3.2.2.60.(2)	Intent Statements
[F04-OS1.3] Fire Safety	**Intent 1:** To limit the probability that loadbearing walls, columns and arches exposed to fire will prematurely fail or collapse, which could lead to the failure or collapse of a supported combustible roof assembly during the time required to achieve occupant safety and for emergency responders to perform their duties, which could lead to harm to persons. **Intent 2:** To limit the probability that a combustible roof assembly exposed to fire will prematurely fail or collapse during the time required to achieve occupant safety and for emergency responders to perform their duties, which could lead to harm to persons.
[F04-OP1.3] Fire Protection of the Building	**Intent 1:** To limit the probability that loadbearing walls, columns and arches exposed to fire will prematurely fail or collapse, which could lead to the failure or collapse of a supported combustible roof assembly during the time required to achieve occupant safety and for emergency responders to perform their duties, which could lead to damage to the building. **Intent 2:** To limit the probability that a combustible roof assembly exposed to fire will prematurely fail or collapse during the time required to achieve occupant safety and for emergency responders to perform their duties, which could lead to damage to the building.

2.2.4 MITIGATING FEATURES

To address the objectives and functional statements, the following mitigating features are provided.

Alternative	Mitigating Features
Fire Protection	Levels 1, 2, and 3 of the original municipal hall will be sprinkler protected and the sprinkler system is to comply with NFPA 13 - 2013
Smoke Detection in Hallway	All hallways will have smoke detectors.
Fire Alarm System	The existing fire alarm system must be revised accordingly to incorporate the new municipal hall addition and the new sprinkler system. The fire alarm system is to comply with CAN/ULC-S524-14 and be monitored by a monitoring station in conformance with CAN/ULC-S561-13. Notification of the fire department must be provided in conformance with CAN/ULC-S561-13, "Installation and Services for Fire Signal Receiving Centres and Systems."

Areas in the original municipal hall where sprinkler protection will be installed are highlighted in the figures below.

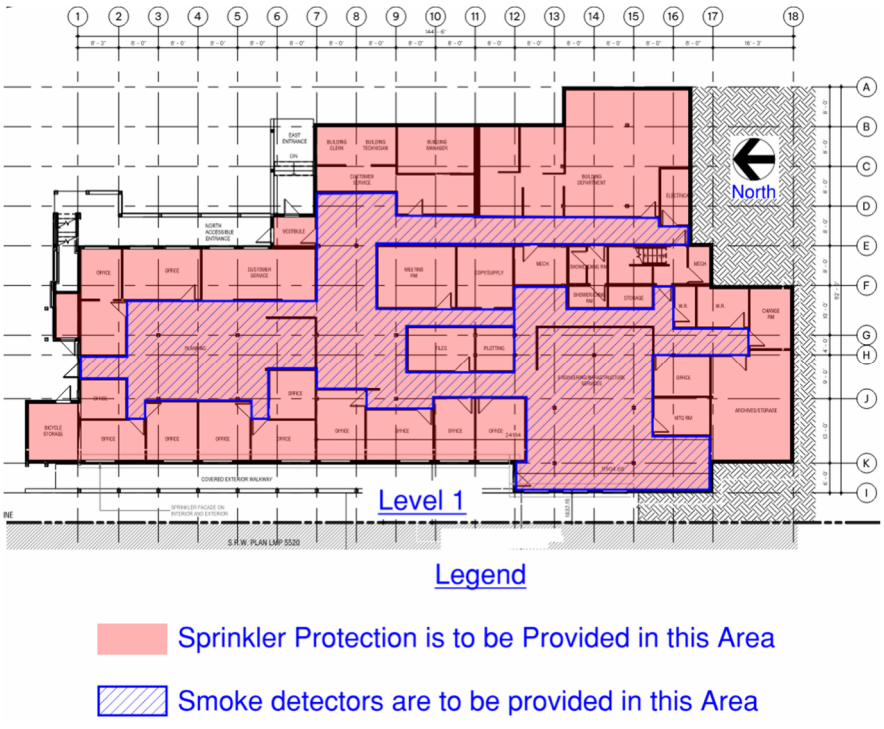


Figure 3: Proposed Areas with Sprinkler Protection and Smoke Detectors

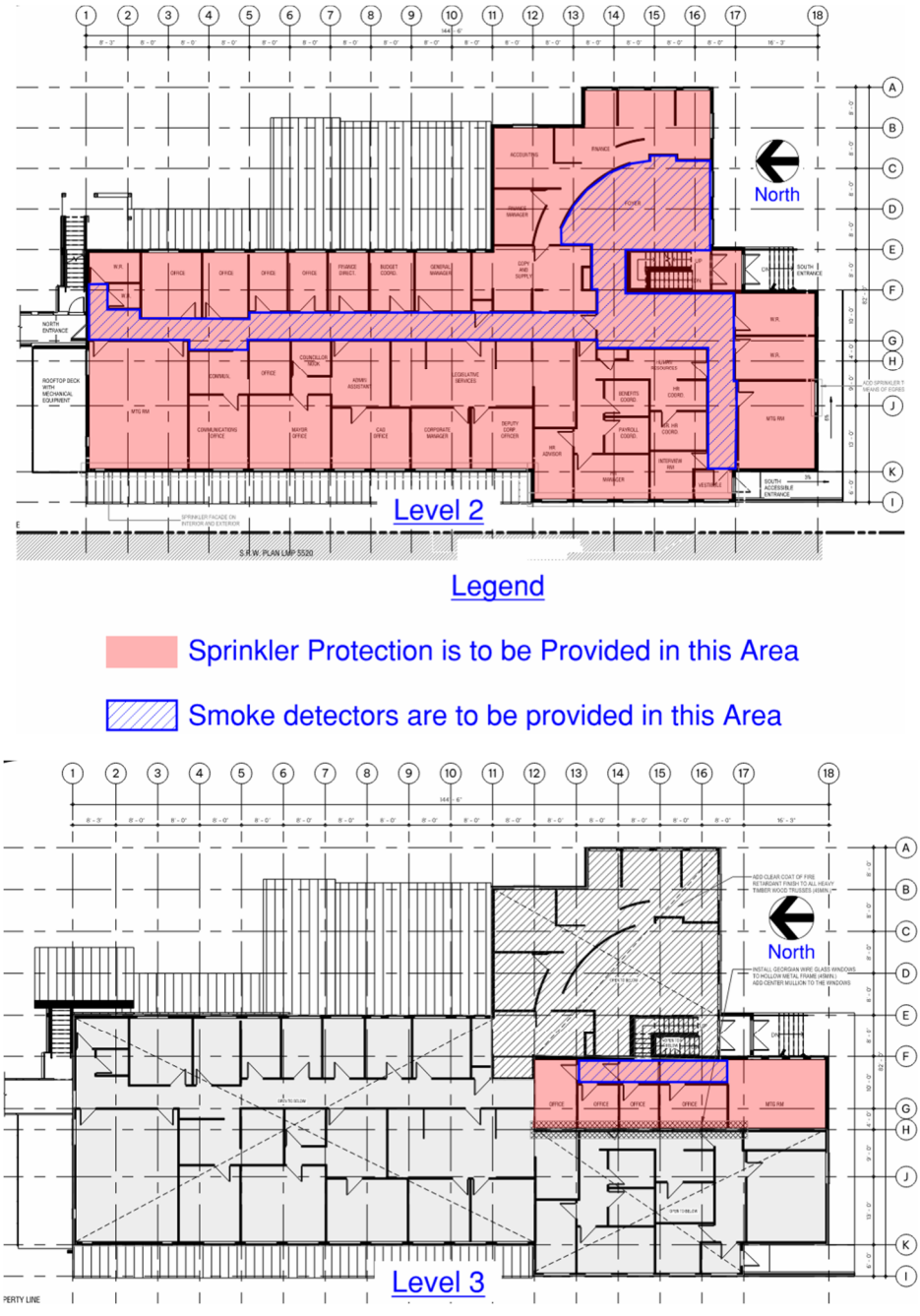


Figure 4: Proposed Areas with Sprinkler Protection and Smoke Detectors

2.2.5 DISCUSSION

The proposed alternative solution addresses the objectives and functional requirements of Sentence 3.2.2.60.(2). The approach and rationale for providing the mitigating features listed in this alternative solution are provided in Table 1.

Table 1: Overall Mitigating Features of Proposed Construction

Overall Construction				
Building Elements	**Code Requirement**	**Proposed Features**	**Justification**	**Increase Fire Protection**
Code Reference	3.2.2.60. permits the expanded municipal hall to remain unsprinklered and the roof of the building is required to have a 45 minute fire resistance rating.	The alternative solution includes providing active fire protection such as a • sprinkler system and • smoke detection. In general, the alternative solution increases the fire protection aspects of the building.	The proposed sprinkler system will be installed in accordance with NFPA 13. With an NFPA 13 sprinkler system in place, the following will be present. • Early Suppression: The sprinkler system can detect and suppress the fire at its early stages, preventing it from growing. • Life Safety: Sprinkler protection will provide occupants with more time to evacuate safety by controlling the fire's growth and spread, thereby, reducing the risk of injury. • Property Protection: The sprinkler system can help minimize property damage by containing fires to their area of origin, limiting the extend of damage to the building and its contents. Based on the above, it is expected that the growth of fire will be slowed by the proposed sprinkler system, thereby reducing the effects of the fire on areas beyond its point of origin. With this in mind, • a fire originating on the floor area of the original municipal hall will be controlled, • the roof of the original municipal hall will be preserved, and • additional time will be provided for occupants on Level 3 to exit the building. Smoke detectors in all hallways of the building will provide early warning to occupants. Smoke detectors will typically activate sooner than sprinklers as smoke spreads earlier and more quickly than heat. Therefore, the smoke detectors can provide earlier warning to occupants in a fire event.	Sprinkler protecting Levels 1, 2, and 3 of the original municipal halls will increase fire protection level. This feature addresses the functional statement: [F04] To retard failure or collapse due to the effects of fire.

2.2.6 MAINTENANCE

Pontem Group will conduct a field review to confirm the construction is in substantial compliance with all of the mitigating features indicated in this alternative solution.

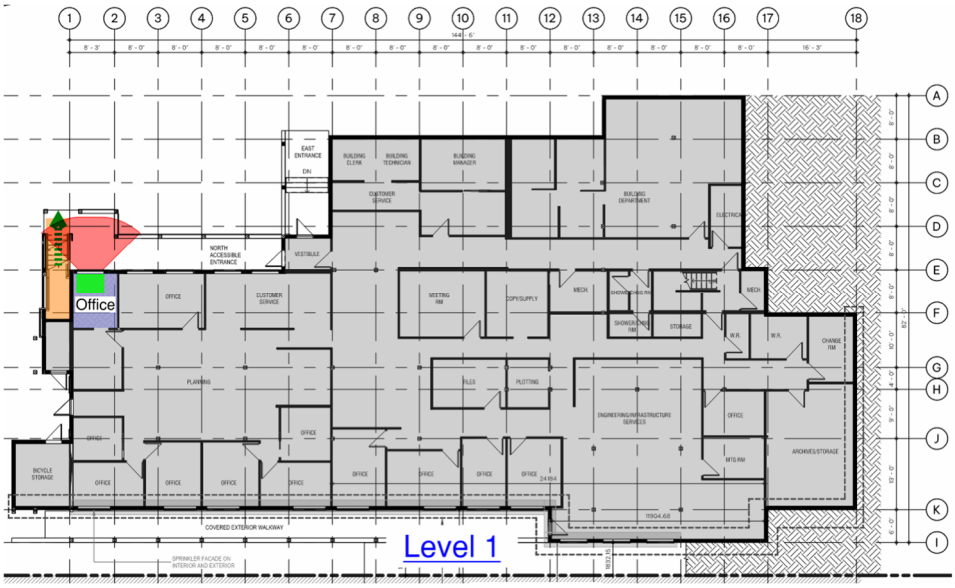
The sprinkler system must be maintained in accordance with NFPA 25 and is the responsibility of the owner.

With the reliance on active fire protection measures, the fire alarm and sprinkler system must be tested annually in accordance with the British Columbia Fire Code (BCFC), CAN/ULC-S537 and NFPA 25.

2.3 MITIGATING FEATURE: PROTECTION OF EXIT FACILITIES – WATER CURTAIN

2.3.1 CODE REQUIREMENTS

Two exterior discharge pathways from exits are exposed by openings in the adjacent fire compartment as shown the figures below.



Legend	Note
	Proposed exit path
	Proposed water curtain

Figure 5: Level 1 Proposed Water Curtain Location

These exit exposure conditions are not being protected through Sentence 3.2.3.13.(4), which states:

3.2.3.13.(4)	**Exit Protection from Fire Exposure**

The opening protection referred to in Sentences (1), (2) and (3) shall consist of

- glass block conforming to the requirements of Article 3.1.8.16.,
- a wired glass assembly conforming to D-2.3.15. in Appendix D, or
- a closure conforming to the requirements of Subsection 3.1.8. and Articles 3.2.3.1. and 3.2.3.14.

The exit exposure conditions will not be provided with wired glass, glass block or listed closures, and will instead be addressed by the water curtain proposed in this alternative solution.

2.3.2 OBJECTIVES AND FUNCTIONAL STATEMENTS

Objectives and Functional Statements of Sentence 3.2.3.13.(4) are as follows:

[F06-OS1.2][F05-OS1.5] and [F06-OP1.2]

OS1	**Objectives**
Fire Safety	An objective of this Code is to limit the probability that, as a result of the design or construction of the building, a person in or adjacent to the building will be exposed to an unacceptable risk of injury due to fire. The risks of injury due to fire addressed in this Code are those caused by
OS1.2	Fire or explosion impacting areas beyond its point of origin
OS1.5	Persons being delayed in or impeded from moving to a safe place during a fire emergency

OP1	**Objectives**
Fire Protection of the Building	An objective of this Code is to limit the probability that, as a result of its design or construction, the building will be exposed to an unacceptable risk of damage due to fire. The risks of damage due to fire addressed in this Code are those caused by
OP1.2	Fire or explosion impacting areas beyond its point of origin

	Functional Statements
F05	To retard the effects of fire on emergency egress facilities.
F06	To retard the effects of fire on facilities for notification, suppression and emergency response.

2.3.3 INTENT STATEMENTS

The intent statements are as follows:

3.2.3.13.(4)	Intent Statement
[F06-OS1.2] **[F05-OS1.5]** **Fire Safety**	**Intent 1:** To limit the probability of the spread of fire from exterior walls or openings of a building to exit facilities, which could lead to: • delays in evacuating or moving to a safe place, which could lead to harm to persons, and • delays in access to the building by emergency responders, which could lead to fire emergency response operations being delayed or ineffective, which could lead to the spread of fire, which could lead to harm to persons, including emergency responders.
[F06-OP1.2] **Fire Protection of the Building**	**Intent 1:** To limit the probability of the spread of fire from exterior walls or openings of a building to exit facilities, which could lead to delays in access to the building by emergency responders, which could lead to fire emergency response operations being delayed or ineffective, which could lead to the spread of fire, which could lead to damage to the building.

2.3.4 MITIGATING FEATURES

To address the objectives and functional statements, the following mitigating features are provided.

Alternative	Mitigating Features
Water Curtain	The proposed water curtain design criteria are indicated in Figure 6.

Tag	Items	Description
A	System:	Water curtain must be a wet system.
B	Zone:	Water curtain may be part of the floor area zone.
C	Sprinkler Type:	Quick response sprinkler with a nominal K-factor of 5.6 and ordinary temperature classification (without ceiling: upright, with ceiling: pendent).
D	Location: (Not Shown)	Water curtain must be spaced at 1,830 mm on center and not more than 910 mm away from the edge of opening.
E	Position:	Water curtain must be mounted not more than 305 mm horizontally from the interior plane of opening.
F	Baffles: (Not Shown)	Sprinkler must be protected from cold solder effects caused by sprinkler discharge at a proximate distance by means of baffles in conformance with NFPA 13.
G	Opening:	Glazed opening may be openable.
H	Obstruction:	Drapes, curtains and blinds are permitted to be installed between the water curtain and the opening.
I	Discharge:	Minimum 4.5 gpm/ft, but not less than 27 USgpm per sprinkler.
J	Hydraulic Design:	Hydraulic calculation must include the water curtain and adjacent floor area sprinklers and hose demand in conformance with NFPA 13.
K	Coverage:	The alternative solution sprinkler head can provide floor coverage subjected to the following: • The discharge must be meet both NFPA 13 and the alternative solution discharge criteria, and • The selected sprinkler must be one that meets the type of sprinkler required for the protected area as per NFPA 13.

Section View

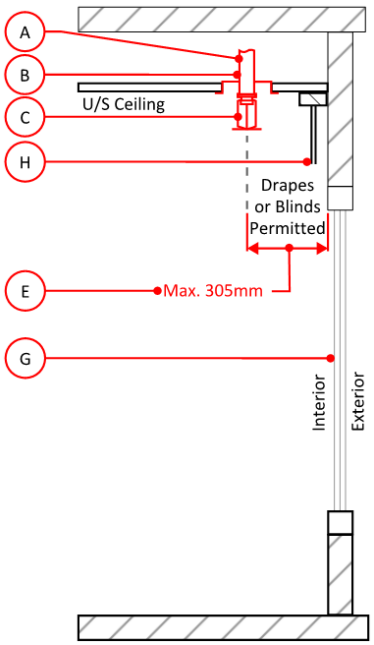


Figure 6: Water Curtain Arrangement

2.3.5 DISCUSSION

The proposed alternative solution addresses the objectives and functional requirements of Sentence 3.2.3.13.(4). The discussions are as follows:

Water Curtain Discussion

The water curtain works to provide opening protection by saturating fire gases in the vicinity of the opening and by absorbing and scattering radiation.

Saturation of Fire Gases

In his research, Leonard Cooper[(1)] from the Center for Fire Research demonstrates that water curtains are an effective means of restricting the flow of heated gases through an opening. The results of his research indicate that water curtain discharge from standard spray sprinklers with a nominal K factor of 5.6 and a minimum flow of 4.5 USgpm/ft is capable of saturating hot gases such that the temperature of the gas does not exceed 100°C. Such cooling of the gases decreases their buoyancy, reducing the potential risk that a fire will spread through the opening.

In Cooper's study, the water curtain was evaluated around the opening of an open stairwell, demonstrating that the effectiveness of the water curtain is not dependent on the use of physical barriers. Glazed openings are therefore permitted to be openable. Furthermore, since the proposed water curtain does not rely on maintaining the integrity of the glazing, drapes, curtains, or blinds installed between glazed openings and water curtain sprinklers are not expected to reduce the level of safety provided by the water curtain. Tempered or laminated safety glass is specified at the protected openings to reduce the risk of injury if the glass fails during a fire emergency.

Radiation Absorption and Scattering

Research by Heselden and Hinkley [(2)] of the British Joint Fire Research Organization shows that sprinkler water spray is effective in reducing radiant heat transfer by scattering and absorbing radiant heat. The proposed water curtain is required to have a minimum flow of 4.5 USgpm/ft, which is expected to absorb more than 50% of the incident radiation (Typically, wired glass is able to provide 50%). This level of performance offers a higher level of protection than a wired glass assembly permitted as an acceptable solution in Sentence 3.2.3.13.(4).

(1) Cooper, L. Y. The Design of Effective Water Spray Cooling in Stairwell-Sprinkler System, National Bureau of Standards, Gaithersburg, Maryland.

(2) Heselden, J. M. and Hinkley, P. L. Measurements of the Transmission of Radiation Through Water Sprays, British Joint Fire Research Organization.

2.3.6 MAINTENANCE REQUIREMENTS

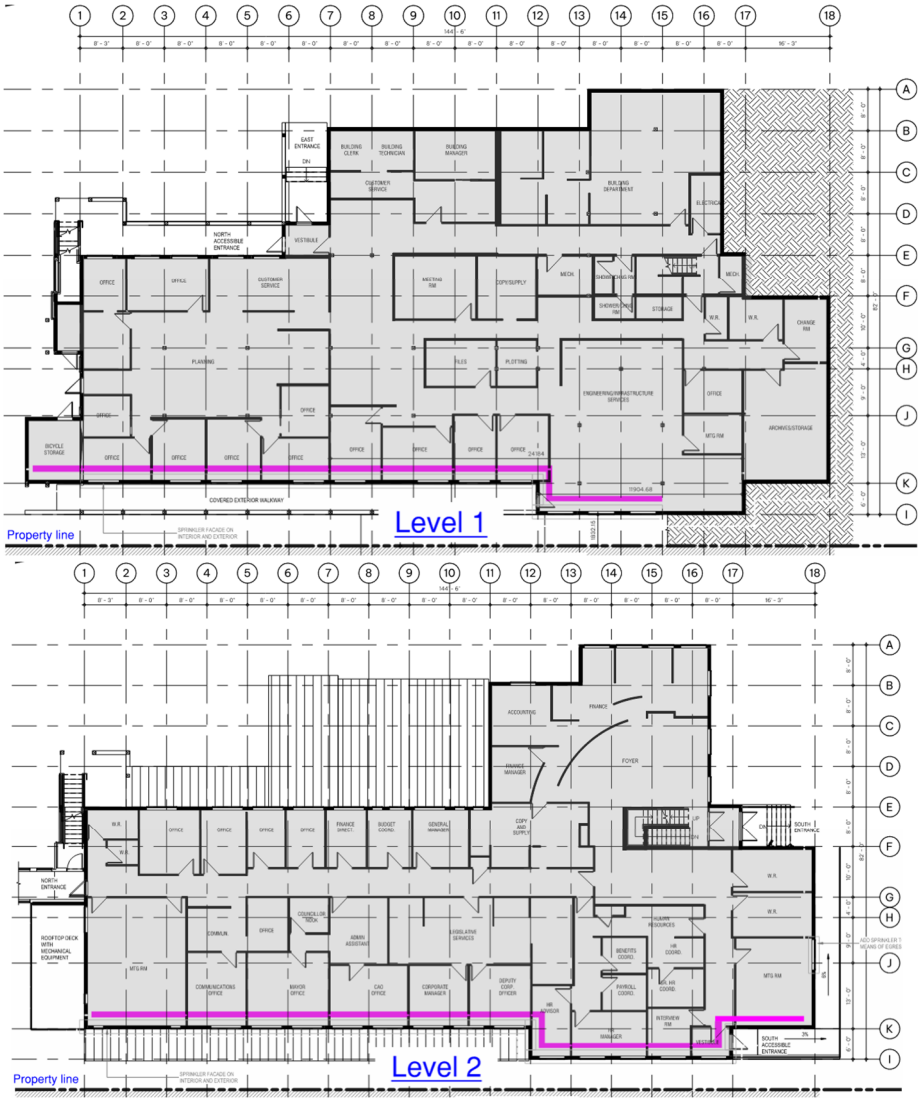
Pontem Group will conduct shop drawing reviews and field reviews to confirm the construction is in substantial compliance with the proposed alternative solution. The water curtain system is expected to be inspected and tested annually in conformance with NFPA 25.

If any changes are proposed in the future, a qualified fire protection consultant will be required to review the proposed work and confirm that the work will not affect the level of fire and life safety assumed in this alternative solution.

2.4 MITIGATING FEATURE: SPATIAL SEPARATION

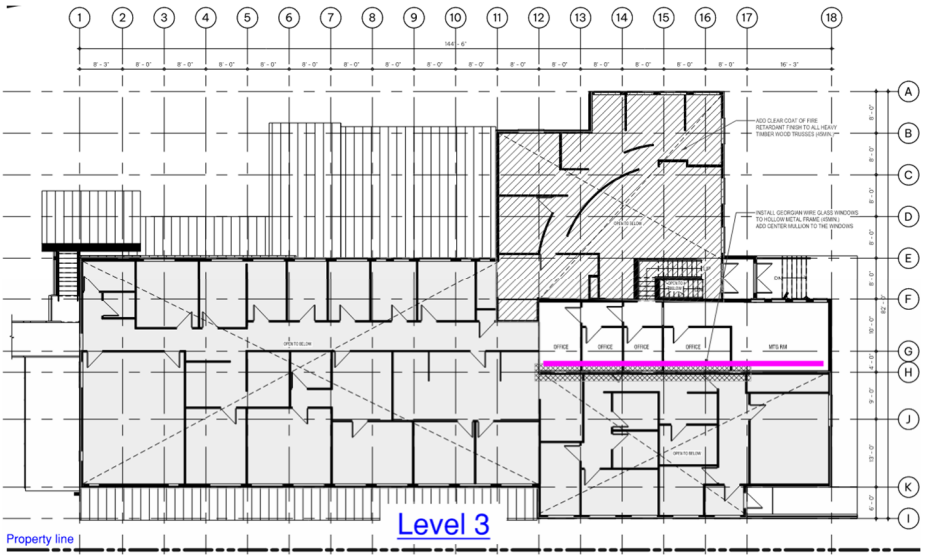
2.4.1 CODE REQUIREMENTS

Due to its proximity to the western property line, the existing exterior wall on the west side of the original municipal hall is to be enhanced. This alternative solution is being proposed to improve the fire safety of the existing west exterior wall of the municipal hall. Closely-spaced sprinklers will be installed along the interior of the west exterior wall, supplemented by the addition of non-combustible cladding to improved fire protection (See Figure 7, Figure 8, and Figure 9).



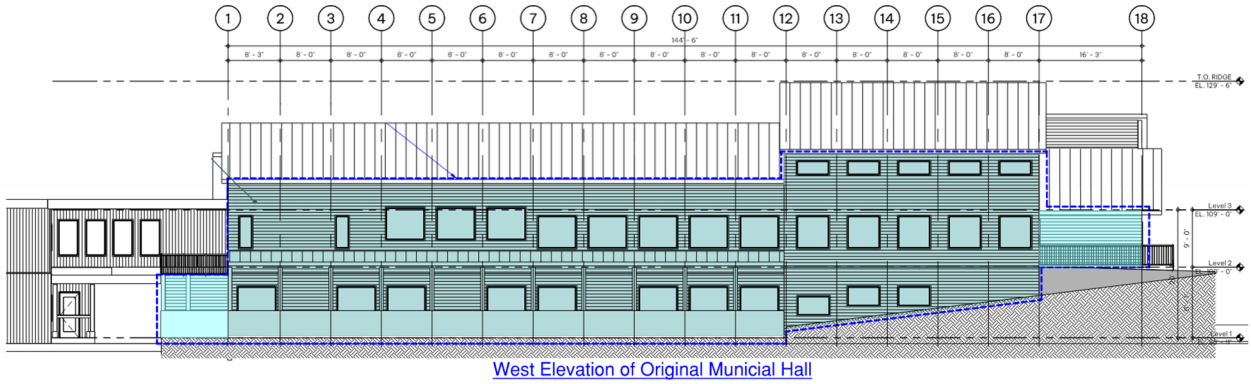
Legend	Note
	Interior closely-spaced sprinklers

Figure 7: Proposed Closely Spaced Sprinklers on Levels 1 and 2 to Enhance the West Exterior Walls



Legend	Note
	Interior closely-spaced sprinklers

Figure 8: Proposed Closely Spaced Sprinklers on Level 3 to Enhance the West Exterior Walls



Legend	Note
	Wall Area to be protected by the proposed Interior closely-spaced sprinklers

Figure 9: Proposed Closely Spaced Sprinklers on Level 1, 2, and 3 to Enhance the West Exterior Walls

3.2.3.1.(1)	Limiting Distance and Area of Unprotected Openings

The area of unprotected openings in an exposing building face for the applicable limiting distance shall be not more than the value determined in accordance with:

- Table 3.2.3.1.-D or 3.2.3.1.-E for an exposing building face conforming to Article 3.2.3.2. of a sprinklered fire compartment that is part of a building which is sprinklered in conformance with Section 3.2.

3.2.3.2.(1)	Area of Exposing Building Face

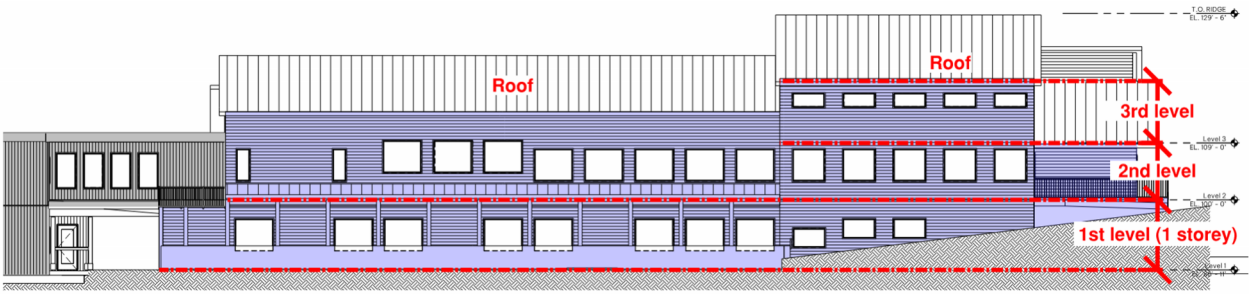
The area of an exposing building face shall be calculated as the total area of an exterior wall facing in one direction on any side of a building measured from the finished ground level to the uppermost ceiling.

The west exterior wall has existing combustible cladding. Due to its proximity to the adjacent properties, the existing west exterior wall will be upgraded, and non-combustible cladding will replace the existing combustible cladding as part of the alternative solution (See Figure 10 and Figure 11).

Legend	Note
	Non-combustible cladding to replace existing combustible cladding

North

Figure 10: Proposed Non-combustible Cladding Locations



West Elevation of Original Municial Hall

Legend	Note
	Non-combustible cladding to replace existing combustible cladding

Figure 11: Proposed Non-combustible Cladding Locations

3.2.3.7.(1) Construction of Exposing Building Face

Except as provided in Sentences (3) and (4), and Articles 3.2.3.10. and 3.2.3.11., the fire-resistance rating, construction and cladding for exposing building faces of buildings or fire compartments of Group A, B, C, D or Group F-3 occupancy classification must comply with .

Table 2: Minimum Construction Requirements for Exposing Building Faces

Occupancy Classification of Building or Fire Compartment	Maximum Area of Unprotected Openings, % of Exposing Building Face Area	Minimum Required Fire-Resistance Rating	Type of Construction Required	Type of Cladding Required
Group A, B, C, D, or Group F, Division 3	0 to 10	1 h	Noncombustible	Noncombustible
	> 10 to 25	1 h	Combustible, Encapsulated mass timber, or Noncombustible	Noncombustible
	> 25 to 50	45 min	Combustible, Encapsulated mass timber, or Noncombustible	Noncombustible
	> 50 to < 100	45 min	Combustible, Encapsulated mass timber, or Noncombustible	Combustible or Noncombustible

2.4.2 OBJECTIVES AND FUNCTIONAL STATEMENTS

The objectives and functional statements of Sentences 3.2.3.1.(1), 3.2.3.2.(1), and 3.2.3.7.(1) are as follows:

[F03-OP3.1]

[F03,F02-OP3.1]

OP3	Objectives
Protection of Adjacent Buildings from Fire	An objective of this code is to limit the probability that, as a result of the design or construction of the building, adjacent buildings will be exposed to an unacceptable risk of damage due to fire. The risks of damage to adjacent buildings due to dire addressed in this code are those caused by -
OP3.1	Fire or explosion impacting areas beyond the building of origin

	Functional Statements
F02	To limit the severity and effects of fire or explosions
F03	To retard the effects of fire on areas beyond its point of origin

2.4.3 INTENT STATEMENTS

The intent statements are as follows:

3.2.3.1.(1)	Intent Statement
Protection of Adjacent Buildings from Fire [F03-OP3.1]	**Intent 1:** To limit the probability of the spread of fire from the building to an adjacent building during the time required for emergency responders to perform their duties, which could lead to damage to adjacent buildings. **Intent 2:** To direct code users to Article 3.2.3.2. for the calculation of the maximum area of unprotected openings in an exposing building face

3.2.3.2.(1)	Intent Statement
	Intent 1: To state how to calculate the area of an exposing building face.

3.2.3.7.(1)	Intent Statement
Protection of Adjacent Buildings from Fire [F02,F03-OP3.1]	**Intent 1:** To limit the probability that an exposing building face will have insufficient fire resistance, which could lead to the spread of fire from the building to an adjacent building during the time required for emergency responders to perform their duties, which could lead to damage to adjacent buildings. **Intent 2:** To limit the probability that an exposing building face will be ignited and contribute to a fire, which could lead to the spread of fire from the building to an adjacent building during the time required for emergency responders to perform their duties, which could lead to damage to adjacent buildings.

2.4.4 MITIGATING FEATURES

To address the objectives and functional statements, the following mitigating features are provided.

Alternative	Mitigating Features
Non-combustible Cladding	The existing combustible cladding on the west exterior wall will be replaced with cement board cladding.
Water Curtain	The proposed water curtain design criteria are indicated in Figure 12.

Tag	Items	Description
A	System:	Sprinkler system must be a wet system.
B	Zone:	Water curtain may be part of the floor area zone.
C	Sprinkler Type:	Quick response sprinkler with a nominal K-factor of 5.6 and ordinary temperature classification (without ceiling: upright, with ceiling: pendent).
D	Location: (Not Shown)	Water curtain must be spaced at 1,830 mm on center and not more than 910 mm away from interior walls.
E	Position:	Water curtain must be mounted not more than 305 mm horizontally from the interior plane of west exterior wall.
F	Baffles: (Not Shown)	Sprinkler must be protected from cold solder effects caused by sprinkler discharge at a proximate distance by means of baffles in conformance with NFPA 13.
G	Opening:	Glazed opening may be openable.
H	Obstruction:	Drapes, curtains and blinds installed between water curtain and opening is permitted.
I	Discharge:	Minimum 4.5 gpm/ft, but not less than 27 USgpm per sprinkler.
J	Hydraulic Design:	Hydraulic calculation must include the following: • Water curtain, • Adjacent floor area sprinklers based on NFPA 13 requirements, and • Hose demand.
K	Coverage:	The alternative solution sprinkler head can provide floor coverage subjected to the following: • The discharge must be meet both NFPA 13 and the alternative solution discharge criteria, and • The selected sprinkler must be one that meets the type of sprinkler required for the protected area as per NFPA 13.

Section View

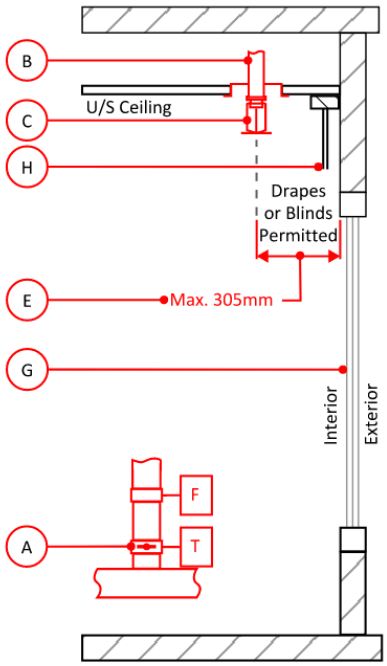


Figure 12: Interior and Exterior Sprinkler Arrangement

2.4.5 DISCUSSION

The proposed alternative solution addresses the objectives and functional requirements of Sentence 3.2.3.1.(1), 3.2.3.2.(1), and 3.2.3.7.(1). The discussions are as follows:

Mitigating Feature	Discussion
Overall	The functional statement of the applicable code references is intended: • To limit the severity and effects of fire or explosions • To retard the effects of fire on areas beyond its point of origin. This alternative solution provides mitigating features that meet the functional statement above. The following are discussed: • Spatial separation construction requirements • Effectiveness of the closely spaced sprinkler protection • Spatial separation reduction
Closely Spaced Sprinklers	The water curtain works to provide opening protection by saturating fire gases in the vicinity of the opening and by absorbing and scattering radiation. The following discusses the effectiveness of closely-spaced pendent sprinklers in suppressing fire. **Saturation of Fire Gases** In his research, Leonard Cooper[(1)] from the Center for Fire Research demonstrates that water curtains are an effective means of restricting the flow of heated gases through an opening. The results of his research indicate that water curtain discharge from standard spray sprinklers with a nominal K factor of 5.6 and a minimum flow of 4.5 USgpm/ft is capable of saturating hot gases such that the temperature of the gas does not exceed 100°C. Such cooling of the gases decreases their buoyancy, reducing the likelihood that a fire will spread through the opening. Since the proposed water curtain follows Cooper's sprinkler criteria, it is expected to fully saturate heated gases and therefore reduce the likelihood of fire spread through the opening. In Cooper's study, the water curtain was evaluated around the opening of an open stairwell, demonstrating that the effectiveness of the water curtain is not dependent on the use of physical barriers. Glazed openings are therefore permitted to be openable. Furthermore, since the proposed water curtain does not rely on maintaining the integrity of the glazing, drapes, curtains, or blinds installed between glazed openings and water curtain sprinklers are not expected to reduce the level of safety provided by the water curtain. Safety glass is specified at the protected openings to reduce the risk of injury if the glass fails during a fire emergency.

Mitigating Feature	Discussion
	Radiation Absorption and Scattering Research by Heselden and Hinkley [(2)] of the British Joint Fire Research Organization shows that sprinkler water spray is effective in reducing radiant heat transfer by scattering and absorbing radiant heat, where heat transmission through the spray from a pendent head installed at 2.75 m above the floor was measured. Experimental results show that for any sprinkler head and water pressure, radiation transmission from sources at 800°C to 1000°C (comparable with that from large fires) is reduced as water flow rate in the radiation path increases, due to heat absorption by evaporation of water droplets from the sprinkler head. The proposed water curtain is required to have a minimum flow of 4.5 USgpm/ft, which is expected to absorb more than 50% of the incident radiation. This allows the sprinkler droplets, which absorb the radiation, to effectively reduce radiation transmission through the proposed glazing and decrease exposure to adjacent properties.
Spatial Separation	**Requirement:** The area of unprotected openings in an exposing building face of an unsprinklered fire compartment shall be no greater than the value determined in accordance with Table 3.2.3.1.-B. **Commentary:** Closely spaced sprinklers installed along the interior portion of the West facing wall are expected to limit the spread of fire from the existing building to the adjacent property. **Proposed Arrangement:** Closely spaced sprinklers are proposed along the interior of the entire North, West facing wall on Levels 1, 2, and 3, including both the wall assembly and openings. Since these sprinklers can effectively reduce radiant heat transfer through the openings near their locations of installation, walls and glazing located within the extent of coverage of sprinklers can be considered as sufficiently protected and are unlikely to expose an adjacent property. The west exterior wall has existing combustible cladding, and they will be replaced with non-combustible cladding. This action aims to improve the existing building performance by demolish sections of the current structure and replace them with non-combustible building material that adhere to the 2018 BCBC regulations. Providing non-combustible cladding will increase fire protection level. This feature addresses both intent statements:

Mitigating Feature	Discussion
	• **Intent 1:** To limit the probability that an exposing building face will have insufficient fire resistance, which could lead to the spread of fire from the building to an adjacent building during the time required for emergency responders to perform their duties, which could lead to damage to adjacent buildings. • **Intent 2:** To limit the probability that an exposing building face will be ignited and contribute to a fire, which could lead to the spread of fire from the building to an adjacent building during the time required for emergency responders to perform their duties, which could lead to damage to adjacent buildings.

(1) Cooper, L. Y. The Design of Effective Water Spray Cooling in Stairwell-Sprinkler System, National Bureau of Standards, Gaithersburg, Maryland.

(2) Heselden, J. M. and Hinkley, P. L. Measurements of the Transmission of Radiation Through Water Sprays, British Joint Fire Research Organization.

(3) Babrauskas, V. Ignition of wood: a review of the state of the art, Journal of Fire Protection Engineering.

2.4.6 MAINTENANCE REQUIREMENTS

Pontem Group will conduct a field review to confirm the construction is in substantial compliance with all mitigating features.

The sprinkler system must be tested annually in accordance with the British Columbia Fire Code (BCFC), CAN/ULC-S537 and NFPA 25. If any changes are proposed in the future, a qualified fire protection consultant will be required to review the proposed work and confirm that the work will not affect the level of fire and life safety assumed in this alternative solution.

The protection measures for upgrading the fire-resistance rating and cladding of the wall are passive protection and there are no specific maintenance requirements, but it will be part of the general building maintenance arrangement.

2.5 CONCLUSION

Based on the discussions in this report, the mitigating features listed in this report:

- limit the severity and effects of fire or explosions (F02),
- retard the effects of fire on areas beyond its point of origin (F03),
- retard failure or collapse due to the effects of fire (F04),
- minimize the effects of fire on emergency egress facilities, and (F05), and
- minimize effects of fire on facilities for notification, suppression and emergency response (F06).

It is reasonable to conclude that the proposed alternative solution will provide at least the level of performance intended by the applicable acceptable solutions of the BCBC.

LICENCE

Engineers and Geoscientists BC has authorized

Justin Wing Hung Lau, P.L.Eng.
Professional Licensee Engineering

Registration/Licence Number: 211939
Granted: December 17, 2019

to engage in the practice of professional engineering in the Province of British Columbia within the Authorized Area of Reserved Practice specified hereunder:

Discipline: **Civil**

Field of Practice: **Building Code Consulting**

Limited to:

1. Building code analysis, consulting, design, and field review of alternative solutions, where the alternative solution area is limited to: applying active fire protection (fire suppression systems and fire detection systems) to replacing or adding to passive fire protection (fire-resistance rating of fire separation or wall and floor assemblies).
2. Reviewing and reporting on building construction for compliance with fire protection, occupant safety, and accessibility requirements of Building Codes and Fire Codes.
3. Providing consulting services on Division A, Division B Parts 1, 2, 3, 8, and 9 (and Part 11of the Vancouver Building By-law representing the upgrade requirements of existing buildings) and Division C of the British Columbia Fire Code, National Fire Code of Canada, and the Vancouver Fire By-law (including associated appendices).

Exclusions:

a. Detailed design of fire protection and fire suppression systems.

b. Fire, explosion, life safety, risk assessment and quantitative analysis.

c. Development of alternative solutions related to smoke control and management, human behaviour and/or using the principles of fire dynamics and fire modelling

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