PROJECT MANUAL:
Introductory Information, Bidding Requirements, Contracting Requirements, Specifications: Divisions 00 to 11

New Central Library
Calgary, Alberta

BP3 - Superstructure - Cores- Building Envelope

Project No.: 03550C01

Date: 2015-09-09 Issued for Bid

This project is required to meet compliance with Canada Green Building Council's (CaGBC) Leadership in Environmental and Energy Design (LEED®) prerequisites and credits necessary to obtain LEED Gold certification for New Construction-2009.
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1.1  WORK OF THIS BID PACKAGE

.1 The Construction Manager, requests Bids for the Work of Bid Package No. 3 Superstructure – Cores – Building Envelope.

.2 Bid Packages form the Scope of Work for the entire project as described in Section 01 11 00 – Summary of Work.

1.2  LOCATION

.1 Work of the Project comprises the construction required for:

   New Central Library Project

1.3  THE OWNER

.1 The Owner is hereby identified as Calgary Municipal Land Corporation (CMLC). Where the word Owner is used, it will be synonymous with Calgary Municipal Land Corporation.

   Calgary Municipal Land Corporation
   429 – 8th Ave. S.E.
   Calgary, Alberta.
   T2G 0L6

.2 Direct communication to the Owner by any Trade Contractor will not be answered. All correspondence and communication will be through the Construction Manager unless instructed otherwise.

1.4  THE CONSULTANTS

.1 The Prime Consultant is hereby identified as:

   Dialog
   300, 134 – 11th Ave S.E.
   Calgary, Alberta.
   T2G 0X5

.2 The Prime Consultant Direct communication to the Consultant by any Trade Contractor will not be answered. All correspondence and communication will be through the Construction Manager unless instructed otherwise.

1.5  WORK FOR THIS CONTRACT

.1 The Work for this Contract is being performed under CCDC 5B (2010) – Construction Management Contract between the Owner and Construction Manager. The Construction Manager for Work of this Contract is:

   David Taylor, Project Manager
   Stuart Olson Construction Ltd.
   600, 4820 Richard Rd SW
   Calgary AB T3E 2L1
   Phone: (403) 520-6565
   Fax: (403) 230-5323
   E-mail: david.taylor@stuartolson.com
.2 The Contract between the successful Trade Contract Bidder and the Construction Manager includes all requirements of the CCDC 5B (2010) – Construction Management Contract between the Owner and Construction Manager, including the requirements of the General Requirements in Division 01 and Technical Specifications in Divisions 02 through 50, and all drawings, schedules and details, and other documents forming a part of the Contract Documents for the Work of this Bid Package.

1.6 ENQUIRIES

.1 Direct all Trade Contractor enquiries regarding Bidding requirements, drawings and specifications to the Construction Manager.

.2 Construction Manager will forward all enquiries to the Consultant. The Consultant will respond to enquiries by issuing an addendum or clarification. Direct contact with the Consultant from Trade Contractors is not permitted.

.3 Direct inquiries during the Bid period to:
   Mr. Joe Elliott, Project Estimator
   Stuart Olson Construction Ltd.
   600, 4820 Richard Rd SW
   Calgary AB   T3E 2L1
   Phone:   (403) 520-6565
   Fax:     (403) 230-5323
   E-mail: joe.elliott@stuartolson.com

1.7 INFORMATION DISCLOSURE

.1 All information provided by the Construction Manager, Owner and Consultant to Bidders and all information provided by Bidders to the Construction Manager, Owner and Consultant as part of, or subsequent to their Bid submission is subject to the disclosure and protection provision of the applicable provincial Personal Information and Protection Privacy Act. This Act allows any person a right of access to records in the Owner’s custody or control, subject to limited and specific exceptions as set out in the Act.

.2 Where applicable, Bidders may identify, under separate covering letter, those portions of any submission from the Bidder to the Construction Manager, Owner or Consultant that the Bidder considers confidential and what harm could reasonably be expected from disclosure. The Owner does not warrant that such identification will preclude disclosure if disclosure is determined to be required under the Act.

1.8 DIVISION OF THE WORK

.1 Work specified in the Specifications is divided into Divisions and Sections for reference purposes only. Provincial trade scope definitions do not apply to this project.

Part 2 THE BIDDING DOCUMENTS

2.1 DOCUMENT ISSUE AND AVAILABILITY

.1 Drawings and specifications are made available by the Consultant for Bid purposes.

.2 Drawings and specifications will be available for viewing at the Construction Manager’s offices as directed by the Construction Manager.

.3 Drawings and specifications will be made available through the following sources for the use of Trade Contractors and Suppliers:
   – CoolNET / Alberta Construction Associations
Part 3  BID FORM

3.1  BID PACKAGE PRICES

.1 Prepare a price breakdown for the Construction Manager to be submitted when requested by the Construction Manager within five (5) days of Bid Submission. Identify price breakdown in a form acceptable to the Construction Manager.

3.2  BID SUBMISSION

.1 Bids will be received no later than 2:01:00 pm local time on September 29, 2015 at the offices of:

Stuart Olson Construction Ltd.
600, 4820 Richard Rd SW
Calgary AB T3E 2L1
Phone: (403) 520-6565
Fax: (403) 230-5323

Bids specifically for concrete formwork will be received no later than 2:01 pm local time September 29, 2015 at the offices of:

Calgary Municipal Land Corporation
429 – 8th Ave SE
Calgary, Alberta.
T2G 0L6
Phone: (403) 718-0300

Bids specifically for concrete formwork must be hand delivered to CMLC’s offices as indicated above.

.2 Submit Bid on form(s) provided. Seal completed Bid Form and Appendices in 225 mm (9") x 305 mm (12") brown envelope, together with required supplementary documents, if any. Mail or deliver to address indicated on the Bid Form. Refer to Section 00 41 00 – Bid Form and Appendices for Bid form used for this Bid package. Faxed Bids will also be accepted subject to the terms specified in Section 3.2.6 below.

.3 Bidders may submit a Bid on any single component of the Bid package, or any combination of components forming a part of the Bid package. Trade Contractor Bidders can combine their Bid Prices to establish required Scopes of Work.

.4 For combined Bids, clearly identify the scope of Work and combinations of components relevant to the Bid on the Bid Form, and on the outside of the sealed envelope, or fax cover sheet, as applicable.

.5 The Construction Manager will accept faxed Bids (except for Concrete formwork), subject to the following conditions:

.1 The Bidder agrees and acknowledges that the Construction Manager’s fax machine are tools of their business, and as such cannot ensure that they will be available at the Bid Closing Time.

.2 It is the Bidder’s responsibility to ensure that the Construction Manager received its faxed Bid before the Bid Closing Time. The Bid is deemed to be submitted when the fax attaching the Bid is received by the Construction Manager’s fax machine, not the time the fax is sent by the Bidder’s fax machine.
.3 If requested, the Bidder will submit to the Construction Manager, after the Bid Closing Time and prior to award of a Contract, the originals of all fax Bids and supplements, together with any requested security.

.6 Bids may be submitted in advance of due date and modified as noted in 3.7.1.2 below.

.7 Time for receiving Bids may only be extended by addendum. Bids will be opened in private by the Construction Manager, Owner and Consultants who will make a list of all Bids submitted for the Owner’s record retention.

3.3 THE BID PRICE

.1 Each Trade Contract Bidder must include as the basis for their Bid Price only those products, materials, construction methods as specifically, called for, or implied in the Drawings and Specifications.

.2 Trade Contractors may make submission to Construction Manager for proposed substitute materials in accordance with Appendix E of the Bid Form. Submit Appendix E within two (2) days from Bid submission.

.3 Consultant will not consider substitute materials during the Bidding Period except those specifically identified in the Bid Documents.

.4 The Bid Price shall be in Canadian funds, inclusive of PST or HST (if applicable) but exclusive of GST.

3.4 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 Bid is based upon visible site conditions.

.3 The Bidder is qualified and experienced to perform the Work in accordance with the Bid Document, demonstrating relevant work experience, a safety record showing that the Bidder has an Employers Experience Ratio of not less than the industry sector average, and a proven and available workforce.

.4 The Bid is based upon performing the Work in accordance with the Bid Document, without exception, and

.5 The price or prices stated in the Bid Form 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.

3.5 NOTIFICATION OF INTENT NOT TO SUBMIT A BID

.1 Prospective Bidders who have received Bid Documents, but do not intend to submit a Bid, are requested to notify the Construction Manager, no later than 24 hours before the Bid Closing Time.

3.6 COMPLETION OF BID FORM

.1 Basis of Bid: Base Bids on a Stipulated Price Bid.

.1 Ensure Bids comply with Drawings and Specifications and include all costs for performance of the Work.

.2 Complete blank portions of the Bid Form and Appendices by neatly and clearly filling in the applicable information or by crossing out non-applicable portions and initialling. Any other alterations or qualifications to Bid Form may cause the Construction Manager to reject the nonconforming Bid.

.3 Sign the Bid Form in accordance with the following requirements:
INSTRUCTIONS TO BIDDERS

.1 Limited Company: Print or type full name of company and name(s) and status of authorized signing officer(s) in space provided. Ensure authorized signing officer(s) sign. Sign in the presence of a witness who must also sign, or in the absence of a witness, affix the corporate seal.

.2 Partnership: Print or type the firm name and name(s) of the person(s) signing in space provided. Ensure that one or more of the partners sign in the presence of a witness who must also sign.

.3 Sole Proprietorship: print or type business name and name of sole proprietor in space provided. Ensure that the sole proprietor signs in the presence of a witness who must also sign.

.4 Ensure that signatories have authority and capacity to enter into Contract on behalf of the Bidder.

3.7 BID WITHDRAWAL AND MODIFICATIONS

.1 Bid Withdrawal:

.1 Bidders may withdraw their Bid at any time up to Bid Closing Time by written request, addressed to and received by the Construction Manager at the place of Bid Closing before Bid Closing Time.

.2 Withdrawn Bids may be resubmitted in accordance with these Instructions to Bidders providing the resubmitted Bid is received at the location indicated, before Bid Closing time.

.2 Bid Modifications:

.1 Modifications may be made to a Bid at any time prior to Bid Closing Time.

.2 Modifications may only be made in writing, addressed and sent to the Construction Manager at the place of Bid closing and indicating the name of the Project, which must be received by the Construction Manager prior to the Bid Closing Time.

.3 Ensure modifications directing a change in a Bid amount reveal neither the original amount nor the revised amount. State only the amount to be added to or deducted from the original Bid amount.

.4 The Construction Manager, Owner or Consultant cannot guarantee that electronic communications equipment will be available at Bid Closing Time and cannot verify the authenticity of the requested modification.

.5 The Construction Manager will not accept responsibility for the content of changes or modifications that are, for any reason, delayed, illegible or otherwise improperly received.

.6 Late or improperly received Bid Modifications may cause rejection of the Bid, at the Construction Manager’s sole discretion.

.7 Persons withdrawing Bids or making Bid Modifications in person, must show letter signed by original Bidder as proof of authorization to do so. Persons not showing proper authorization will not be allowed to modify or withdraw a Bid.

Part 4 BID APPENDICES

4.1 APPENDIX A – LIST OF SUB-SUBCONTRACTORS AND SUPPLIERS

.1 This appendix has not been included with the bid documents. Bidders must be prepared to submit a list of sub-subcontractors and suppliers post-tender at the discretion of the Construction Manager.

.2 Where a Bidder indicates in Appendix A that a particular category of Work will be performed by his own forces, within two (2) days of request by the Consultant, the Bidder must be prepared to submit documentary evidence to demonstrate that he has
established forces qualified and capable of performing that portion of the Work, and will not let that portion of the Work be performed by subcontract if his Bid is accepted.

4.2 **APPENDIX B – SEPARATE AND ITEMIZED PRICES**

.1 This appendix has not been included in the bid documents.

4.3 **APPENDIX C – LIST OF UNIT PRICES**

.1 This appendix has not been included in the bid documents.

4.4 **APPENDIX D – ALTERNATIVE PRICES**

.1 The Construction Manager reserves the right to accept any, or none of the Alternative Prices. Ensure that Alternative Prices only reflect the difference between the original specified provision and the alternative provision.

.2 Include Alternative Price Form with the Bid Form submission.

4.5 **APPENDIX E – LIST OF PROPOSED SUBSTITUTIONS**

.1 Ensure prices only reflect the difference between the original specified provision and the alternative provision.

.2 Submit this list with the Bid Submission. The Construction Manager will submit a list of all proposed Substitutions to the Consultant for approval before signing of the Subcontract agreements.

.3 Proposed substitutions will not be used to arrive at the Bid Price. Use only specified items to establish the Bid Price.

.4 Refer to Section 01 60 00 – Product Requirements for administration requirements for Proposed Substitutions.

.5 The Consultant will not consider any requests for substitutions during the Bidding period.

.6 The Owner has the right of acceptance or denial of all proposed Substitutions/Alternatives.

.7 With requests for substitution include with the Bid Submission:

.1 Complete data substantiating compliance of the proposed substitute with contract requirements.

.2 For products: product identification, including manufacturer’s name and address; manufacturer’s literature, including product description, performance and test data, reference standards, and limitations; samples, if appearance is relevant; names and addresses of similar projects where the product has been used.

.3 For construction methods: detailed description of the proposed method, and drawings illustrating it.

.4 Itemized comparison of proposed substitution with product or method specified.

.5 Data relating to changes in schedule.

.6 Quotation for change in contract sum if substitution is approved. Indicate recycled content, VOC emissions, and recycling potential of proposed substitutions. Provide Material Safety Data Sheets (MSDS) with each proposed substitution.

.7 Substitutions will not be considered which are implicit in submitted shop drawings or samples rather than formally presented proposals as described above.

.8 Substitutions will not be considered which require substantial changes in the contract documents.
.8 In making a request for substitution the Bidder represents that he has personally investigated the proposal and determined that it is equal or superior to the product or method specified; that the same guarantee will be furnished for the substitute as for the original; that he will co-ordinate installation of the accepted substitute into the work, making such changes in the work as may be required to accommodate the change; that he waives all claims for additional compensation for costs which subsequently become apparent arising out of the substitution; and that the quotation is complete and includes all related costs under this contract.

.9 Advise the Construction Manager and Consultant of all adjustments and changes necessary in the work to accommodate the substitution.

.10 Should the proposed substitution be accepted, either in part or in whole, assume full responsibility when the substitution affects the work of any other Bidders. Pay for any drawing changes required as a result of the substitution, and all costs for changes to the work resulting from the substitution.

4.6 APPENDIX F – LIST OF FORCE LABOUR AND EQUIPMENT RATES

.1 Include a complete list of Force Labour and Equipment Rates with Bid Form submission.

4.7 APPENDIX G – LIST OF KEY PERSONNEL

.1 This appendix has not been included with the bid documents. Bidders must be prepared to submit a list of key personnel post-tender at the discretion of the Construction Manager.

.2 The Construction Manager and the Owner will review the submissions, and reserve the right to not award a contract to any Bidder they feel is not qualified through experience or lack of appropriate personnel.

.3 The Construction Manager may request alternative personnel be proposed for this project.

4.8 APPENDIX H - CAPACITY STATEMENT

.1 Bidders are asked to submit annual volume in dollars, total workforce complement, current commitments during the identified construction period and available resources.

4.9 APPENDIX I - CLARIFICATIONS

.1 Include a list of clarifications to the bid price with the Bid Form submission. These may be included as an attachment to the Bid Form on company letterhead.

4.10 APPENDIX J - REFERENCES

.1 FORMWORK ONLY: Include a list of projects, personnel, and references that provide evidence of the successful completion of Architecturally Exposed Concrete by the bidder.

Part 5 BID ACCEPTANCE PROCEDURES

5.1 BID OPENING

.1 Trade Contractor Bids will be opened in private immediately after the Bid Closing Time. All information arising from the Bid Opening will be considered confidential and the Construction Manager is not obligated to notify Bidders or the public of the Bid Prices. No other information will be provided.

5.2 BID ACCEPTANCE PERIOD

.1 A Bid may not be withdrawn after the Bid Closing Time and the Bid will be irrevocable and open for acceptance by the Construction Manager until the earlier of:
.1 The Construction Manager has entered into a Contract for performance of the Work with another party; or,

.2 60 days after the Bid Closing Time, whichever occurs first.

The 60 days period referred to above commences at 12:00 midnight of the day fixed for receiving Bids and terminates at 11:59pm of the 60 days thereafter. If the 60 days falls on Saturday or Sunday, or on a statutory holiday, extend to the following business day.

5.3 **BID EVALUATION AND AWARD OF SUBCONTRACT**

.1 After Bids are received, the Construction Manager may invite one or more Bidders to a Bid clarification meeting. If, as a result of clarification, or otherwise, the Bid is clarified, amended, increased or decreased, the Bidder agrees that the clarified or amended Bid constitutes its Bid hereunder which will remain open for acceptance by the Construction Manager for the time and manner herein provided for the acceptance of the Bid.

.2 The Construction Manager may use a variety of evaluation criteria for the selection of any successful Bids, including but not limited to, the Bidder’s commercial and technical merit, the Bidder’s health and safety record, the Construction Manager’s past experience with the Bidder, the Owner’s past experience with the Bidder and the perceived reputation of the Bidder.

.3 The Construction Manager reserves the right to accept, in its sole discretion, any one or more of the Bids.

.4 The Construction Manager reserves the right, in its sole discretion, to not award to the lowest or to any Bidder.

.5 The Construction Manager reserves the right, in its sole discretion, to reject any or all Bids for any reason.

.6 The Construction Manager reserves the right to waive any irregularities, omissions or errors in any Bid.

.7 Additions or subtractions arising from Separate, Itemized, Unit and Alternative Prices Proposed Substitutions and Combined Bids required by the Bid documents may be used to determine the lowest Bid:

.1 The Construction Manager reserves the right to accept or reject any or none of the Separate, Itemized, Unit and Alternative Prices Proposed Substitutions and Combined Bids listed in the appendices.

.2 The Construction Manager reserves the right to establish the Contract Price based on Separate, Itemized, Unit and Alternative Prices Proposed Substitutions and Combined Bids listed in the appendices prepared by the accepted Bidder.

.8 Construction Manager reserves the right to request information that they may reasonably require confirming Bidder’s qualifications in respect of the Bid submission as stated in 5.3.2 of this Section. Such requests do not constitute a counter offer to the Bid.

.9 If the Construction Manager selects a Bid, it will then provide the successful Bidder with execution copies of the Subcontract that the Bidder agrees to execute and return to the Construction Manager with all documentation including specified subcontract security, proof of insurance, and Worker’s Compensation clearance within seven (7) days of receipt of the Subcontract.

.10 Under no circumstances will the Construction Manager or Owner pay any costs or expenses incurred by any Bidder in the preparation or submission of a Bid, or be liable to an unsuccessful Bidder for any or damage that an successful bidder may suffer or incur, including lost profits, as a result of its participation in this Request for Bids or as the result of the acceptance by the Construction Manager or Owner of any Bid whatsoever, including a non-compliant Bid. By submitting a Bid in response to this Request for Bids,
a Bidder shall be deemed to have agreed that it has no such claim against the Construction Manager or Owner.

.11 After a Bid has been accepted, the Bid securities for all rejected Bidders will be returned to the respective Bidders.

5.4 MULTIPLE / COMBINED BIDS

.1 Bidders may submit Bids on more than one Subcontract Scope of Work as follows:

.1 Complete Bid form quoting the discounted combined Bid price and reference the attachment described in sentence 5.4.2.

.2 Attach to the Bid form, on the letterhead of the Bidder, a listing of each Section, together with the scope description and the Bid price for each individual scope of Work, the sum of the Bid prices, the discount offered for the combination, and the resulting Bid Price.

.3 Each individually priced scope constitutes a separate offer and is open to acceptance or rejection by the Construction Manager.

.4 Combined Bids: When a Bidder wishes to offer a discount that applies to the total of all trade scopes contained in the multiple Bid, provide the discount as a reduction to the total of all individual scope offers in the Bid.

.5 Where a Bidder submits a Bid for more than one scope of work, only one contract security need be submitted if security is required by the Bid documents, however provide such contract security for the amount of the combined Bid and identify separately the individual scopes included. Include a copy of the Bid security with each separate Bid.

.6 Combined Bids will be evaluated by comparison to the sum of the individual lowest valid Bids received for each scope of work included in the combined Bid.

Part 6 CONTRACT FORM

6.1 FORM OF CONTRACT

.1 Once the Owner has accepted the Construction Manager’s pricing and proposed list of project participants, the Trade Contract Bidder will enter into a Contract with Construction Manager:

The Contract to be executed between the Construction Manager and the successful Trade Contract Bidder will be the Stuart Olson Subcontract Agreement complete with Appendices outlined in Section 00 51 00 – Trade Contractor Agreement and General Conditions.

Part 7 EXAMINATION OF BID DOCUMENTS AND SITE

7.1 BIDDERS RESPONSIBILITIES

.1 Examine and read the Bid Documents thoroughly.

.2 Site visit:

.1 All Bidders are to visit the site to become familiar with conditions affecting their Work.

.2 The Bidder is advised to carry out its own investigations of all site conditions and the construction methods and/or techniques that may be appropriate, together with all matters that may affect the Bidder’s costs and performance of the work required to be provided by the Bidder as the Bidder is required to accept all risks of all such conditions and construction methods or techniques anticipated by the Bidder in the preparation of its Bid Claims for extra payment and extensions to the completion date will not be considered in respect of conditions which, in the
opinion of the Construction Manager, could have been ascertained by an inspection of the site prior to close of Bids.

.3 Bidders are to arrange for access to and inspection of the site.

.4 Bidders are responsible for inspecting the site and for making whatever inquiries or arrangements are necessary for them to become fully informed of the nature of the site and of the work to be performed, and, by the submission of its Bid, acknowledges that it has investigated and satisfied itself as to:

.1 The nature of the work;

.2 The location of and all conditions relating to the site including, but not limited to accessibility, general character, surface conditions, utilities, roads, uncertainties of seasonal weather and all other physical, topographical geological and geographic conditions;

.3 The general character, quality, quantity and availability of equipment and materials required to execute and complete the work;

.4 All environmental risks, conditions, laws and restrictions applicable to the Bidders or their work;

.5 All conditions affecting labour, including, without limitation, availability, productivity, and administrative practices, including those related to safety, prevailing at, or applicable to, the work or site; and

.6 The magnitude of the construction work required in executing and completing the work.

.5 The Construction Manager is not responsible for undertaking any investigations to assist the Bidder. Any information, plans, drawings, reports or other documents, which are not included or referred to in the Contract Documents, form no part of this Bid. The Construction Manager assumes no responsibility of any kind whatsoever arising from or relating to its failure to include or refer to such information, plans, drawings, reports or other documents. Bidders, who obtain or rely upon such information, plans, drawings, reports or other documents, do so at their own risk.

.6 Bidders are to:

.1 Consider effect of regulatory requirements applicable to the Work;

.2 Consider the effect of their Work and Work of others on the constructability of the Project;

.3 Study and correlate Bidder's observations with the Bid Documents, and

.4 Immediately notify the person identified by Construction Manager for receiving inquiries of all perceived omissions and discovered conflicts, errors, and discrepancies in the Bid Documents.

7.2 PRE-BID INFORMATION SESSION

.1 A pre-bid information session for all Bidders will be held on Thursday, September 17, 2015. During this time, bidders will be introduced to the building 3D model and informed about the coordination and logistics challenges presented by the construction schedule. A site visit will follow. The following sessions have been made, please ensure that you attend the appropriate session:

.1 Concrete Formwork and Reinforcing Steel – 9:00 am

.2 Structural & Miscellaneous Steel and Metal Deck – 11:00 pm

.3 All other scopes identified in Section 01 11 00 – 3:00 pm

.2 Personal Protective Equipment is required to be worn during the site visit. This includes hard hat, steel toe boots, reflective vest, etc.

.3 Attendance at this PRE-BID INFORMATION SESSION meeting is optional, but strongly recommended.
7.3 DISCREPANCIES AND OMISSIONS

.1 If Bidders find any discrepancy in or divergence between the Drawings and Specifications, and the General Conditions of the Contract:

.1 Immediately notify the Construction Manager in writing and specifically request any necessary instructions.

.2 The Construction Manager will forward all written notifications along with recommendations, to the Consultant for clarification.

.3 The Consultant will issue written instructions or explanations to the Construction Manager in the form of an Addendum.

.4 The Construction Manager, the Consultant, or the Owner will not be held responsible for oral instructions.

.2 Failure to report any observed discrepancies or omissions as judged by the Construction Manager and Consultant, will permit the Construction Manager and/or Consultant to make his own interpretation and disqualify any claims.

7.4 INTERPRETATION AND MODIFICATION OF BID DOCUMENTS

.1 Interpretation and Modification of Bid Documents will only be made by the Consultant. The Construction Manager will direct all requests for interpretation or modification of the Bid Documents to the Consultant.

.2 Submit questions about the meaning and intent of the Bid Documents to the person identified by Construction Manager for receiving inquiries.

.3 Interpretations and modifications considered necessary by the Consultant will be issued in writing in the form of an Addendum.

.4 Replies to questions, interpretations and modifications made in a manner other than by written Addendum are not binding and without legal effect.

7.5 ADDENDA

.1 Include in the Bid, provisions of all Addenda issued during the Bid period and ascertain before Bid submission that all Addenda issued have been received.

.2 Submit all questions in writing to the Construction Manager. Questions directed to the Consultant will not be answered unless they are received from the Construction Manager.

.3 Before the date Bids are received, any and all interpretations of the Drawings and Specifications will be in the form of written Addenda. The Consultant and Construction Manager will not be responsible for verbal or any other explanations or interpretations of Drawings and Specifications not covered in written Addenda.

.4 Addenda will be prepared and issued by the Consultant only. Construction Manager will provide all information for Addenda to the Consultant for inclusion in the Addenda.

.5 The Consultant and Construction Manager will endeavour to issue Addenda no later that three (3) calendar days from the Bid closing date. The Consultant and Construction Manager, however, reserve the right to issue instructions within this period by electronic transmission.

.6 Addenda, if issued, will be sent as promptly as practical to Bidders of record to whom complete Bid Documents have been issued and will become part of the contract documents.

.7 Confirm receipt of all Addenda on the Bid Form. Failure to acknowledge receipt of Addenda and indicate date received may cause rejection of the Bid.
Part 8  PROJECT SPECIFIC INFORMATION

8.1  BID SECURITY

.1 Bid security is not required for this project.

8.2  SUBCONTRACT SECURITY - CONTRACTOR DEFAULT INSURANCE (CDI)

.1 In the event that a bid is equal to or greater than $100,000, the Bidder must be eligible for enrolment in the Construction Manager’s Contractors Default (CDI) Insurance Program.

.2 Bidders must provide the necessary information to enable the Risk Analyst to undertake a risk assessment for the purposes of determining eligibility for enrolment in the CDI program.

.3 Although a Bidder may have been enrolled in the Construction Manager’s CDI program in the past, the Bidder may be required to provide updated information for the Risk Analyst to reassess their continued eligibility for enrolment in the program.

.4 The Bidder will not incur any costs to participate in the CDI program.

.5 The Construction Manager reserves the right to reject a Bid if the Bidder is not eligible for enrolment in the CDI program.

8.3  PERFORMANCE ASSURANCE

.1 Refer to Section 00 61 13 - Contract Security.

8.4  INSURANCE

.1 Trade Contractors are required to provide, at their own expense and cost, insurance coverage in the amounts and terms stated in Section 00 51 00 – Trade Contractor Agreement and General Conditions.

8.5  AVAILABILITY OF SPECIFIED ITEMS

.1 Verify before Bidding, that all specified items will be available in time for installation during orderly and timely progress of the Work.

.2 In the event specified items will not be so available, notify the Construction Manager before receipt of Bids, and identify appropriate substitute in place shown in Appendix E of the Bid Form.

.3 Costs of delays arising from availability of specified items, when the Trade Contractor could have avoided such delays, will be back-charged as necessary and will not be borne by the Owner.

8.6  SCHEDULING

.1 Perform the Work expeditiously and with adequate forces to achieve total completion of Work prior to date established by the Construction Manager’s construction schedule.

.2 To meet the required schedule for various areas, the Trade Contractor(s) must work normal and off-hours as required and as directed by the Construction Manager.

.3 Commence proprietary Work immediately upon Contract award and be available for Project Progress meetings as required.

8.7  APPLICABLE LIEN LEGISLATION

.1 The Builders’ Lien Legislation applicable to the jurisdiction in which the project is located applies.
.2 Where applicable, subcontractor holdbacks may be progressively released on this project, and will be reviewed for each subcontract as necessary.

8.8 VALUE ADDED TAX

.1 Goods and Services Tax (GST) applies to Work of this Project. Do not include any amount in the Bid Form for the GST. GST will be accounted for and administered in Progress Draws as directed by the Construction Manager.

.2 Where applicable, Bidders must include PST and HST (if applicable) in the Bid Price.

8.9 LEED™ CERTIFICATION

.1 This project will conform to the Canadian Green Building Council’s Leadership in Energy and Environmental Design Green Building Rating System for New Construction and Major Renovations 2009, targeting a Gold rating. Comply with all LEED™ program requirements as noted throughout the Bidding documents.

.2 The Owner required the Construction Manager and trade Contractors to efficiently use resources to the fullest extent possible in the completion of this project. Resource efficient aspects to be considered in completing this project, in conformance with the LEED™ Gold target as specified in Division 01.

END OF SECTION
1 General

1.1 RELATED REQUIREMENTS

1.1.1 Instructions to Bidders: Submission of Bid Enquiry during the Bid Period for questions arising from Available Project Information requiring response from Consultant.

1.2 DEFINITIONS

1.2.1 Available Project Information: Means only information that was available to the Consultant and Construction Manager during preparation of the Contract Documents; consisting of any type and in any form relating to the Work and that does not form a part of the Contract Documents, and that could be useful to the Subcontractor’s ability to understand the Work required for the Project.

1.2.2 Contract Documents: All documents and information of any type and in any form, specifically prepared for use of Contract by Consultant and listed on Construction Manager’s Agreement Form.

1.3 ADMINISTRATIVE REQUIREMENTS

1.3.1 Coordination and Status of Available Project Information: Available Project Information identified in this section; or any part thereof, are not part of Contract unless specifically incorporated into Contract Documents; Consultant has incorporated components of Available Project Information affecting design or detailing of Work by means of copying, transcribing or referencing into the Specifications and Drawings.

2 Products

2.1 AVAILABLE PROJECT INFORMATION

2.1.1 The following Available Project Information documents are available from Construction Manager upon request from Subcontractor Bidder:

2.1.1.1 Geotechnical Investigation:
2.1.1.2 Risk Management Plan prepared by Stantec
2.1.1.3 Phase II Environmental Site Assessment prepared by Stantec
2.1.1.4 Wind Study prepared by Entuitive
2.1.1.5 Copy of Construction Manager’s insurance policy available for review by Subcontractors.
2.1.1.6 Additional Available Project Information that may become available during Bidding Period not issued to Bidders with Bid Documents will be available for examination at Construction Manager’s office location listed in Instructions to Bidders.
2.1.1.7 Bidders may examine above Available Project Information during normal office hours, 8:00 AM to 5:00 PM daily.

2.1.1.8 Direct inquiries during Bid period to person identified by Construction Manager in Instructions to Bidders to receive inquiries.

2.2 ADDITIONAL AVAILABLE PROJECT INFORMATION

2.2.1 The following Available Project Information documents are appended to this Section:

2.2.1.1 Preliminary Construction Schedule prepared by Construction Manager indicating start and completion dates of Subcontractors activities.

3 Execution

3.1 IMPLEMENTATION

3.1.1 Use Of and Reliance upon Available Project Information: Available Project Information is made available to Bidder for the purpose of providing Bidder with access to information available to Owner, Construction Manager, and Consultant:

3.1.1.1 Available Project Information is not intended to be considered a representation or warranty that information contained in any information documents is accurate, complete, or appropriate.

3.1.1.2 Bidder may interpret and draw conclusions about Available Project Information and is encouraged to obtain specialist advice with respect to this information where concerns are identified by the Bidder.

3.1.1.3 Owner, Construction Manager and Consultant assume no responsibility for any interpretations made by the Subcontractor for any interpretations and conclusions unless addressed and answered by submission of a Bid Enquiry.

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

END OF SECTION
1 General

1.1 ENVIRONMENTAL SITE ASSESSMENT

1.1.1 An environmental site assessment on the building site has been performed by:

Stantec Consulting Ltd.
200, 325 – 25 Street S.E.
Calgary, Alberta
T2A 7H8

Title: Phase II Environmental Site Assessment
802 – 3 Street SE, East Village,
Calgary, Alberta

File No. 110861422.250
Date: April 2012

1.1.2 A copy of this information is available at the office of the Construction Manager.

END OF DOCUMENT
1 General

1.1 SOILS REPORT

1.1.1 A sub-soil investigation on the building site has been performed by:

Tetra Tech EBA Inc. (Tetra Tech EBA)
Riverbend Atrium One, 115, 200 Rivercrest Drive SE
Calgary, AB T2C 2X5 CANADA

Title: GEOTECHNICAL EVALUATION
PROPOSED NEW CENTRAL LIBRARY
7 AVENUE AND 3 STREET SE
CALGARY, ALBERTA

Submitted to: MHPM Project Managers Inc. C/O Calgary Municipal Land Corporation

File No.: C12103304-01

Date: June 2014, Issued for Use

1.1.2 A Letter Report the foundation recommendations for the proposed landscape structures and geofoam at the New Central Library site has been performed by Tetra Tech EBA Inc. (Tetra Tech EBA) titled "Foundation Recommendations, Proposed Landscape and Geofoam Structures, New Central Library, 7 Avenue and 3 Street SE, Calgary, Alberta", dated December 19, 2014, File C12103352-03.

1.1.3 A copy of this information is available at the office of the Construction Manager or available upon request.

1.2 SUBSURFACE CONDITIONS

1.2.1 This soils information was obtained only for Owner's use in foundation design and is not part of Contract Documents. Information and log of borings is available for Construction Manager's information, but is not warranty of subsurface conditions. Construction Manager may use information at his own risk.

1.2.2 Construction Manager must visit site and acquaint himself with site conditions. Prior to bidding, Construction Manager may make his own subsurface investigation to satisfy himself with site and subsurface conditions.

1.2.3 Construction Manager should also enquire of found subsurface conditions from other construction projects adjoining site or in close vicinity.

1.2.4 Should soil conditions be encountered that substantially differ from soils information, Construction Manager to cease Work immediately and contact Consultant and await Consultant's directive.
2 Products

2.1 PRODUCT APPROVAL

2.1.1 All fill material shall be subject to approval of soil Engineer.

3 Execution

3.1 NOT APPLICABLE

END OF DOCUMENT
SUBMIT TO:

Mr. Joe Elliott
Stuart Olson Construction Ltd.
600, 4820 Richard Rd SW
Calgary AB T3E 2L1
Phone: (403) 520-6565
Fax: (403) 230-5323

On behalf of the Owner: Calgary Municipal Land Corporation (CMLC)

PROJECT: New Central Library
Bid Package No. 3 Superstructure-Cores-Building Envelope

BIDDER:

(Legal Name)

(Street Address)

(City, Province, Postal Code)

TRADE CONTRACT:

(Refer to Construction Manager’s Summary of Work)

DESCRIPTION:

(Brief description of scope of work)

1 Bid Price

1.1 Having visited the site and examined all conditions affecting the named trade Work, are satisfied we understand the Bid Documents and declare ourselves competent to undertake and complete the named trade Work and do hereby irrevocably bid and agree to carry out the named trade Work in accordance with the Bid Documents and addenda.

(Bidder to fill in addenda received):

<table>
<thead>
<tr>
<th>Addendum Number</th>
<th>Issue Date</th>
<th>Addendum Number</th>
<th>Issue Date</th>
<th>Addendum Number</th>
<th>Issue Date</th>
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</table>
and confirming that our Bid Price is based on specified provisions only,

and confirming that our Bid Price is in Canadian funds and is inclusive of PST and HST (if applicable) but exclusive of GST.

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 Bid Price, the amount of which is in Canadian funds and is inclusive of PST and HST (if applicable) but exclusive of GST, indicated below.

<table>
<thead>
<tr>
<th>Bid Price Stated in Words (Including Allowances)</th>
<th>Total in Figures</th>
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<tbody>
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</tr>
</tbody>
</table>

Submitted this _____ day of _____________ 20___.

2 Declarations

I/We agree to attain Substantial Performance of the Work by date established by the Construction Manager’s schedule.

I/We state that no person, firm or corporation other than the undersigned has any interest, financial or otherwise, in this Bid or in the proposed Contract for which the Bid is made;

I/We hold that this bid is held irrevocable and is open to acceptance by the Construction Manager until 60 days after the bid closing time.

In submitting this Bid I/we understand that an Addendum prior to bid closing or a Bid Revision after bid closing will not be called if minor changes to the Bid Documents are contemplated by the Construction Manager, or after Bid Closing.

The Construction Manager reserves the right to request a Bid Revision from any or all Bidders where significant modifications to the Bid Documents become apparent at, or after Bid Closing.

I/We agree that within five (5) days after notification in writing by the Construction Manager of the acceptance of this Bid, within the time limits of the bid acceptance period stated above, that we will:

2.6.1 Execute the Agreement between Construction Manager and Trade Contractor as specified in Section 00 51 00 – TRADE CONTRACTOR AGREEMENT AND GENERAL CONDITIONS.

2.6.2 Commence construction within seven (7) days of the date of acceptance of this Bid or other period as may be directed in writing by the Construction Manager.

2.6.3 Furnish Contract Security as outlined in Section 00 61 13 – Contract Security.
3.1 This Bid includes the following:

3.1.1 Appendix A – List of Sub-Subcontractors and Suppliers – not included
3.1.2 Appendix B – Separate and Itemized Prices – not included
3.1.3 Appendix C – Unit Prices – not included
3.1.4 Appendix D – Alternative Prices Form
3.1.5 Appendix E – Proposed Substitutions submitted for review as noted in Section 00 21 00 – Instructions to Bidders.
3.1.6 Appendix F – Force Labour and Equipment Rates
3.1.7 Appendix G – List of Key Personnel – not included
3.1.8 Appendix H – Capacity Statement
3.1.9 Appendix I – Clarifications
3.1.10 Appendix J – References – FORMWORK ONLY

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/Type)

______________________________________________
Name/Title of Witness

______________________________________________
Contact Name for Required Bid Clarification (If Necessary)

______________________________________________
Contact Number(s)
**APPENDIX D – ALTERNATIVE PRICES FORM**

**PROJECT:** New Central Library  
Bid Package No. 3 Superstructure-Cores-Building Envelope

**BIDDER:**

(Legal Name)

The following are our prices, which are inclusive of PST or HST (if applicable) but exclusive of GST, for the Alternative Work listed hereunder. Such Alternative Work and amounts are **NOT INCLUDED** in our Bid Price.

<table>
<thead>
<tr>
<th>Trade Package</th>
<th>Description of Work</th>
<th>Effect on Bid Price ($)</th>
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</thead>
<tbody>
<tr>
<td></td>
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<td>Addition</td>
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<tr>
<td>03 10 00</td>
<td>Delete Architectural Formwork and replace with Regular formwork</td>
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APPENDIX E – PROPOSED SUBSTITUTIONS

PROJECT: New Central Library
Bid Package No. 3 Superstructure-Cores-Building Envelope

BIDDER: (Legal Name)

The following are our prices, which are inclusive of PST or HST (if applicable) but exclusive of GST, for the Substitution Work listed hereunder. Such Substitution Work and amounts are NOT INCLUDED in our Bid Price. Coordinate with Sections 00 21 00 – Instructions to Bidders and 01 60 00 – Product Requirements.

<table>
<thead>
<tr>
<th>Specification Section Number</th>
<th>Description of Proposed Substitution</th>
<th>Effect on Bid Price ($)</th>
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<tbody>
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*Attach additional sheets as necessary to complete Contractor’s list of Substitutions*
APPENDIX F – FORCE LABOUR AND EQUIPMENT RATES

PROJECT: New Central Library
Bid Package No. 3 Superstructure-Cores-Building Envelope

BIDDER: 
(Legal Name)

1. It is understood that:
   .1 This Schedule of Labour and Equipment Rates is subject to Construction Manager’s approval and will be used solely for evaluating Trade Contractor Proposals for changes in the Work.
   .2 The Construction Manager has not established, and does not intend to establish, minimum wages or benefits applicable to the Work, other than those required by law.
   .3 The Force Labour Rates are all inclusive for total labour cost including payroll burden, but excluding overhead and profit, are as listed in Section 01 26 00, and listed as $/Hour

2. Schedule: Provide all requested information.

3. Force Labour Rates for Personnel Employed by Trade Contractor:

<table>
<thead>
<tr>
<th>Name of Trade</th>
<th>Trade Classification</th>
<th>Regular Time</th>
<th>Premium Time</th>
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</thead>
<tbody>
<tr>
<td>Site Superintendent</td>
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<tr>
<td>Foreman</td>
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<tr>
<td>Journeyman</td>
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<tr>
<td>Labourer</td>
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4. Labour Rates for Trades Employed by Sub-subcontractors:

<table>
<thead>
<tr>
<th>Name of Trade</th>
<th>Trade Classification</th>
<th>Regular Time</th>
<th>Premium Time</th>
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5. Construction Equipment: All inclusive Rates, list all equipment proposed for use on this project, mark N/A if no equipment is being used:

<table>
<thead>
<tr>
<th>Equipment Description</th>
<th>Estimated Hours</th>
<th>Cost Per Unit</th>
<th>Regular Time/Hour</th>
<th>Over Time/Hour</th>
<th>Day Month</th>
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<tr>
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<td>Move-On</td>
<td>Move-Off</td>
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<td>Week</td>
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</table>

Attach additional sheets as necessary to complete Force Labour and Equipment Rates
APPENDIX H – CAPACITY STATEMENT

PROJECT: New Central Library
Bid Package No. 3 Superstructure-Cores-Building Envelope

BIDDER: (Legal Name)

Bidders are to submit the following:

Annual volume of Work in Dollars: $ __________
Total work force complement: __________

Current commitments during the identified construction period:

<table>
<thead>
<tr>
<th>Project Name</th>
<th>Contract Amount</th>
<th>Timeline</th>
<th>Average Man Power</th>
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Resources Available:

________________________________________________________________________
________________________________________________________________________
________________________________________________________________________
________________________________________________________________________
APPENDIX I – CLARIFICATIONS

PROJECT: New Central Library
Bid Package No. 3 Superstructure-Cores-Building Envelope

BIDDER: (Legal Name)

Specify clarifications to your bid price as necessary:

Attach additional sheets as necessary to complete Clarifications

END OF SECTION
APPENDIX J – REFERENCES

PROJECT: New Central Library
Bid Package No. 3 Superstructure-Cores-Building Envelope

BIDDER: ____________________________
(Legal Name)

FORMWORK: Provide evidence of projects, personnel, and references where Architecturally Exposed Concrete was completed successfully. Use the space below or attach pages as required.

END OF SECTION
Part 1 General

1.1 CONTRACT FORM

.1 The Contract to be executed between the Construction Manager and the successful Trade Contract Bidder will be the Stuart Olson Subcontract Agreement. A copy of the Subcontract Agreement Terms and Conditions is included at the end of this section. The form will be modified so that:

.1 Where the term “Contractor” is used, it will be synonymous with the term Construction Manager as defined in item 1.5 of Section 00 21 00 – Instructions to Bidders.

.2 Where the term “Subcontractor” is used, it will be synonymous with the term Trade Contractor as defined in the Construction Manager’s Agreement Form with the Owner.

.3 All of the General Conditions and Definitions from the Construction Managers Agreement with the Owner apply to the Trade Contract agreement form as further modified in the individual sections of Division 01.

.4 The following Appendices will form part of this Subcontract:

Appendix A – Invoicing Procedures
Appendix B – Scope of Work
Appendix C – List of Drawings, Specifications and Addenda
Appendix D – Construction Schedule
Appendix E – Request to Work After Hours or Non-Working Days
Appendix F – Trade Contractor Safety Requirements
Appendix G – Professional Services Rider
Appendix H – Supplementary Conditions

1.2 INSURANCE

.1 The Construction Manager will provide insurance coverage as outlined in the General Conditions of Prime Contract referred to in Section 00 52 00 – Construction Manager Agreement and General Conditions.

.2 Trade Contractors are required to provide, at their own expense and cost, the following insurance coverages:

.1 Commercial general liability insurance, including coverage for completed operations hazards;

.2 Automobile liability insurance covering all licensed vehicles owned, leased or operated by the Subcontractor in the performance of the Work;

.3 Aircraft and watercraft liability insurance with respect to owned or non-owned aircraft or watercraft, if used directly or indirectly in the performance of the Work;

.4 Equipment insurance covering all construction machinery, temporary buildings, equipment and tools used by the Subcontractor in the performance of the Work;

.5 Worker’s Compensation insurance covering all employees engaged in the Work in accordance with the statutory requirements of the Province or Territory having jurisdiction over such employees; and
.6 Such other insurances that may be deemed required by the Owner or Contractor.

.3 The minimum limits of insurance to be provided by the Subcontractor shall be no less than five million dollars ($5,000,000) per occurrence.

.4 The Subcontractor’s Commercial General Liability insurance shall name both the Contractor and Owner as Additional Insured and shall provide that the insurer shall waive any right of subrogation against the Contractor and the Owner. The Subcontractor’s equipment insurer shall also waive any right of subrogation against the Contractor and the Owner.

.5 Cooperate and provide all required submittals relating to Owner’s OCIP insurance program.

.6 All policies shall be placed with insurers licensed to do business in the jurisdiction of the location of the Project.

.7 All policies shall be endorsed to provide 30 days prior written notice of cancellation to the Contractor and the Owner.

1.3 HEALTH, SAFETY AND ENVIRONMENT:

.1 Comply with all statutory and administrative requirements of governing bodies having jurisdiction in the location at which the work is undertaken.

.2 Become fully familiarized and comply with all requirements of the health, safety and environmental program established by Construction Manager and as may be supplemented by site specific policies. Copies of the health, safety and environmental program are available for review in the plan room of the construction manager’s office, or by contacting the Construction Manager’s superintendent at the project site office.

.3 If so requested by the Construction Manager, submit a copy of company safety program and develop and submit policies for site specific operations or procedures.

.4 In any instance where the Trade Contractor’s own program exceeds that of the Construction Manager in terms of standards or stringency, the Trade Contractor’s program governs.

Part 2 Products

2.1 NOT USED

.1 Not Used.

Part 3 Execution

3.1 NOT USED

.1 Not Used.

END OF SECTION
STUART OLSON CONSTRUCTION LTD. SUBCONTRACT

Date:  
Subcontract No.:  
Division Code:  
Project No.:  
Project Name:  
Project Location:  

Subcontractor:  
Address:  

Attention:  
The subcontractor agrees with Stuart Olson Construction Ltd. (the "Contractor") to supply all work and material (the "Work") required for the performance of the Subcontract described as follows:

THE WORK

Attached Appendices A, B, C, D, E, F, G and H shall form part of this Subcontract as follows;  
Appendix A - Invoicing Procedure to be followed  
Appendix B - Scope of Work  
Appendix C - List of Drawings and Specifications  
Appendix D - Construction Schedule  
Appendix E - Request to Work after Hours or on Non-Working Days  
Appendix F - Trade Contractors Safety Requirements  
Appendix G - Professional Services Rider  
Appendix H - Supplementary Conditions  
The subcontractor shall commence the Work no later than 5 days after instructions from the Contractor to mobilize or commence work.

Subcontract Price: $  
Plus GST/HST: $  
Plus PST: $  
Total Price: $

Contractor: Stuart Olson Construction Ltd.  
Signature: ____________________________________________ Affix Seal Here  
Print Name: ____________________________________________  
Title: ____________________________________________

Witness Signature: ____________________________________________  
Witness Name: ____________________________________________  
Date: ____________________________________________

Subcontractor:  
[Subcontractor Name]  
Signature: ____________________________________________ Affix Seal Here  
Print Name: ____________________________________________  
Title: ____________________________________________

Witness Signature: ____________________________________________  
Witness Name: ____________________________________________  
Date: ____________________________________________
SUBCONTRACT TERMS AND CONDITIONS

1. SCHEDULE
The Subcontractor shall perform the Work in accordance with the Contractor's overall Project Schedule. The Contractor may reasonably adjust the Project Schedule from time to time as the Work progresses after consultation with the Subcontractor. Prior to commencing the Work, the Subcontractor shall provide a detailed schedule for the Work that is compatible in all regards with the Project Schedule and satisfactory to the Contractor. The Subcontractor acknowledges there may be other subcontractors or the Contractor’s own forces working on site and shall follow the Contractor's reasonable instructions with respect to coordinating the Work with such parties. If the Subcontractor fails to comply with the Project Schedule, the Subcontractor shall become immediately liable for all liquidated damages, costs and other damages incurred by the Contractor to the extent caused by the Subcontractor.

2. THE WORK
   a) The Subcontractor shall furnish all necessary labour, tools, equipment and material to perform the Work. The Subcontractor shall perform the Work in compliance with the Drawings and Specifications set out in Appendix C (if any) and all requirements, drawings and specifications applicable to the Work contained in the prime contract (the "Prime Contract") between the Contractor and the Owner. The Subcontractor acknowledges it is familiar with the Prime Contract, copies of which remain available at the office of the Contractor.
   b) The Subcontractor shall perform the Work in full accordance with the requirements of the Subcontract and of the Prime Contract. The terms, conditions, obligations and liabilities of the Prime Contract that apply to the Work are incorporated by reference into this Subcontract as if the defined term for the Owner is replaced with "Contractor" and the defined term for the Contractor is replaced with "Subcontractor". In the event of any inconsistency, discrepancy or contradiction between the requirements of this Subcontract and the requirements of the Prime Contract, the provisions requiring the higher quality or more stringent or restrictive performance of the Work shall apply.
   c) The Subcontractor shall perform the Work:
      i) in a safe, prudent, workmanlike, expeditious manner using experienced, competent personnel;
      ii) with no less a degree of skill and care than that demonstrated by an experienced, competent subcontractor providing similar services on a similar project; and
      iii) in compliance with all applicable laws, regulations, standards and codes including without limitation those relating to occupational health and safety and the environment.
   d) The Contractor, the Owner or their representatives may inspect or test the Work at any time and the Subcontractor shall cooperate and make the Work available for inspection or testing. If the Work does not conform to the requirements of the Subcontract or Prime Contract, the Subcontractor shall promptly reperform or replace such Work to the satisfaction of the Contractor and so that the Work complies with the requirements of the Subcontract.
   e) Title to all materials and supplies with respect to the Work shall vest in the Contractor at the earlier of:
      i) delivery to the Project site;
      ii) payment for such Work, materials or supplies; and
      iii) the time stipulated by the Prime Contract.
   f) The Subcontractor shall protect the Work from damage. The Subcontractor shall have the risk of loss or damage to the Work and to all materials and supplies until substantial performance of the Work (as defined by applicable Builders Lien legislation) or earlier written acceptance by the Contractor.
   g) The Subcontract Price (as amended pursuant to this Subcontract) shall be the Subcontractor’s sole and all-inclusive compensation for the performance of this Subcontract and completion of the Work. The Subcontract Price is inclusive of PST (if applicable) but exclusive of GST/HST.

3. PAYMENT
   a) For the purposes of the Builders Lien legislation applicable at the location of the Project, the Contractor shall be responsible for issuing all required certificates and performing the role of “payment certifier” or similar if required by such legislation.
   b) The Subcontractor shall submit invoices in duplicate to the Contractor by the 20th day of the month for any Work completed in that month. Monthly invoices shall include and specifically refer to any Change Orders approved by the Contractor for changes in the Work completed in that month or any previous month. Notwithstanding the foregoing, the Contractor shall not be obliged to pay any invoice submitted more than six months after the end of the month to which the invoice relates.
   c) The Contractor will require, as a condition of each payment, a statutory declaration in the form CCDC 9B declaring the Subcontractor has paid all accounts for work and materials supplied by it in performance of the Work and a current clearance from the applicable Workers Compensation Board (or similar) confirming the Subcontractor has made all current payments for assessment.
   d) The Contractor will pay all invoices of the Subcontractor for Work performed by the Subcontractor in amounts approved by the Project Consultant (if applicable) and the Contractor less the applicable holdback required under the terms of the Builders Lien legislation and any other deductions in accordance with the terms of this Subcontract by no later than the earlier of:
      i) seven days after the date the Contractor is paid by the Owner for the work under the Prime Contract which includes Work which is the subject of an invoice of the Subcontractor, to the extent of payment to the Contractor by the Owner for that Work, or
      ii) sixty days from submission of any invoice of the Subcontractor in amounts approved by the Project Consultant and the Contractor.
   e) Payment of the holdback retained from the Subcontractor pursuant to the applicable Builders Lien Legislation shall be made within seven days of receipt by the Contractor of the applicable holdback funds from the Owner and on the condition that neither the Subcontractor nor any material supplier, sub-subcontractor or worker claiming under or through the Subcontract have filed a claim of lien against title to the Project.

(Revised 03 June 2014)
The Subcontractor shall promptly pay for all its subcontractors, materials and labour used in the Work. In the event of claims of lien being filed by any sub-subcontractor, supplier or labourer claiming under or through the Subcontractor or this Subcontract, the Subcontractor shall promptly cause such lien to be discharged or cancelled at its own expense. If the Subcontractor fails to do so within a reasonable time, the Contractor may cause such lien to be discharged or cancelled and the Subcontractor shall become immediately liable for all amounts, costs and expenses required to do so including legal fees on a “solicitor and client” basis.

The Contractor may set off as against any amount due or accruing due to the Subcontractor:

i) the amounts of any claims arising from third parties claiming under or through the Subcontractor;

ii) any amounts otherwise owed to the Contractor by the Subcontractor; and

iii) any other amounts as set out in this Subcontract.

The Subcontractor acknowledges and agrees that the provision of all operations and maintenance manuals, spare parts, test certificates, drawings, personnel training, warranty certificates and similar items is essential and necessary for the use of the Work. The Subcontractor acknowledges and agrees that substantial performance of the Subcontract (as defined by applicable Builders Lien legislation) cannot be achieved until the satisfactory provision of all such items required by the Subcontract. The Contractor may withhold 5% of the Subcontract Price until all such items are provided.

The Contractor may retain a holdback from the Subcontractor equivalent to two times the estimated value of deficiencies and the cost to complete portions of the Work and payment of such holdback shall only become due upon completion or correction of the said Work as certified by the applicable parties. Failure to complete or correct the Work will result in the Contractor applying such holdback towards the costs of completing or correcting the said Work by the Contractor or a third party, and if the cost to do so exceeds the amount held back, the Subcontractor shall immediately become liable for all additional amounts required to do so.

4. CHANGES IN THE WORK

No changes to the Work ("Changes") shall be undertaken or commenced by the Subcontractor without written Change Order issued by the Contractor. Any Change (including with respect to the Work, the Subcontract Price and Subcontractor’s schedule) shall be as mutually agreed. Failing agreement between the parties within a reasonable time, the Contractor may issue a Change Order on such reasonable terms as it determines and the Subcontractor shall comply with such Change Order without prejudice to its right to subsequently dispute such terms.

5. INSURANCE

a) The Subcontractor shall, without limiting its obligations or liabilities as stated elsewhere in this Subcontract, obtain and continuously maintain at its own expense and cost, the following insurance coverages:

i) Commercial general liability insurance, including coverage for completed operations hazards;

ii) Automobile liability insurance covering all licensed vehicles owned, leased or operated by the Subcontractor in the performance of the Work;

iii) Aircraft and watercraft liability insurance with respect to owned or non-owned aircraft or watercraft, if used directly or indirectly in the performance of the Work;

iv) Equipment insurance covering all construction machinery, temporary buildings, equipment and tools used by the Subcontractor in the performance of the Work;

v) Worker’s Compensation insurance covering all employees engaged in the Work in accordance with the statutory requirements of the Province or Territory having jurisdiction over such employees; and

vi) Such other insurances that may be deemed required by the Owner or Contractor.

b) The minimum limits of insurance to be provided by the Subcontractor under 5 (a) (i), (ii) and (iii) shall be no less than five million dollars ($5,000,000) per occurrence. Such insurance shall be maintained for at least 6 years following completion of the Project.

c) The Subcontractor’s Commercial General Liability insurance shall name both the Contractor and Owner as Additional Insured and shall provide that the insurer shall waive any right of subrogation against the Contractor and the Owner. The Subcontractor’s equipment insurer shall also waive any right of subrogation against the Contractor and the Owner.

d) All policies shall be placed with insurers licensed to do business in the jurisdiction of the location of the Project.

e) All policies shall be endorsed to provide 30 days prior written notice of cancellation to the Contractor and the Owner.

f) On projects where the Contractor or Owner provides Course of Construction and/or Wrap Up Liability insurance, such insurance will be subject to deductibles. The applicable deductible shall be the obligation of the party causing the damage or the injury. In the case of Course of Construction losses, if no responsible party can be established, the deductible shall be borne by the party or parties whose work has been damaged in proportion to such damage.

g) Evidence of all insurance to be provided by the Subcontractor shall be delivered prior to commencement of the Work and in any event as a condition precedent to any payment by the Contractor as otherwise provided for under this Subcontract.

6. TERMINATION AND RIGHT OF THE CONTRACTOR TO COMPLETE THE WORK

a) If the Subcontractor should:

i) become insolvent;

ii) fail to meet its financial obligations as they become due;

iii) be adjudged bankrupt or become subject to a receivership order; or

iv) make an assignment for the benefit of its creditors

the Contractor may by written notice terminate or suspend the Subcontractor’s right to continue the Work, terminate this Subcontract or place the Subcontractor in default of the Subcontract. None of the preceding remedies shall prejudice the Contractor’s right to call on any bond or other security provided by the Subcontractor.
b) If:
   i) the Subcontractor fails or neglects to perform the Work properly;
   ii) the Subcontractor fails to perform the Work in accordance with the Project Schedule;
   iii) the Subcontractor is in breach of this Subcontract; or
   iv) a labour dispute delays or otherwise adversely impacts the Subcontract Work (such labour dispute including without limitation, any dispute, disruption, strike, cessation of work, refusal to work as directed by the Contractor, any slow-down or activity which restricts or limits or may limit the progress of the Work, picketing or activity in support of pickets at the Project site or any lockout involving the Subcontractor or any related company)

   then the Contractor may by written notice place the Subcontractor in default of this Subcontract.

c) If the Subcontractor is placed in default and the Contractor at its sole unfettered discretion determines the default is capable of being cured within a satisfactory time period, the Subcontractor shall have three (3) business days to cure the default to the satisfaction of the Contractor, or, if the default cannot be cured in such period, such longer time as is reasonable and set out in the written notice. If the default is not cured in the time specified or is not capable of being cured, the Contractor may, without prejudice to any other remedies it may have, do one or more of the following:
   i) correct or arrange to have corrected such default at the Subcontractor’s cost;
   ii) suspend or terminate the Subcontractor’s right to continue with the Work;
   iii) suspend or terminate the Subcontract;
   iv) withhold all further payments and amounts otherwise owed to the Subcontractor;
   v) take possession of the Work and, subject to the rights of third parties, utilize the Subcontractor’s equipment and plant to complete the Work by whatever means it considers expedient;
   vi) instruct the Subcontractor to assign to the Contractor any or all its agreements with its subcontractors, labourers and material suppliers, and the Subcontractor shall promptly do so;
   vii) charge the Subcontractor the amount by which the cost of finishing the Work exceeds the unpaid balance of the Subcontractor Price; and
   viii) call on part or all of any bond or other performance security provide by the Subcontractor.

d) If the Contractor terminates or suspends the Subcontract or the Subcontractor’s right to continue with the Work, the Contractor will be entitled to retain out of any sums due or to become due to the Subcontractor, an amount sufficient to indemnify the Contractor from and against any loss or damage which may be suffered by the Contractor as a result of such insolvency or default. The Subcontractor’s warranty obligations up to the time of such termination shall continue in force after such termination.

e) If the Contractor requests the Subcontractor to resume any or all of the suspended Work, the Subcontractor shall resume the performance of that Work. The Contractor may, at its sole discretion, extend the Subcontractor’s schedule for the Work by a period of time equal in length to any suspension.

f) In the event that the Prime Contract expires or is otherwise terminated prior to the completion of this Subcontract, the Contractor may terminate this Subcontract and its sole liability to the Subcontractor shall be to pay the Subcontractor for all Work successfully completed up to the date of termination.

g) All remedies expressly set out in this Subcontract shall be independent of each other, shall not merge, and shall be in addition to any other rights or remedies the Contractor may have at law or in equity.

7. SUBCONTRACTOR’S ADDITIONAL COVENANTS

The Subcontractor shall:
   a) indemnify the Contractor and its parents, subsidiaries, agents, directors, employees, successors and assigns, for all damages, losses and expenses (including legal costs on a solicitor and client basis) which they may suffer or incur, and hold them harmless from and against all claims, demands and actions brought against them (including claims by third parties for property damage, injury or death), all to the extent arising out of or resulting from the performance of the Work or caused by the negligent acts or omission of the Subcontractor or anyone for whose acts the Subcontractor may be liable;
   b) as required at the time of bidding or as otherwise agreed in writing between the parties (i) comply with the Contractor’s Default Insurance program requirements; or (ii) provide surety bonds in a form acceptable to the Contractor and maintain such bonds in good standing until completion of the Work and discharge of all warranty obligations.
   c) provide a competent, experienced, responsible superintendent of the Work who shall not be replaced without the consent of the Contractor whose consent shall not be unreasonably withheld;
   d) obtain and pay for all permits, licenses and certificates required for the Work; and
   e) at all times, remove and keep removed from the site of the Work all debris resulting from its operations and upon completion of the Work remove all temporary structures belonging to the Subcontractor and leave the premises in a workmanlike and tidy condition.

8. WARRANTY

The Subcontractor warrants the Work against all defects and deficiencies of materials and workmanship (collectively “Defects”) for a period of one year from the date of substantial completion of the Prime Contract, or such longer period as required by the Prime Contract (either period being the “Warranty Period”). Upon written notice of Defects being provided to the Subcontractor during the Warranty Period, the Subcontractor shall promptly and at its own cost repair or correct all Defects to the satisfaction of the Contractor, acting reasonably. The Subcontractor shall further be liable for all costs to remove and replace any parts of the Project or Contractor’s work required to implement this warranty and for any repairs and damage to any other parts of the Project caused by the warranty work.
9. **DISPUTE RESOLUTION**

a) The parties shall first make reasonable good-faith attempts to resolve all disputes and other matters arising from this Subcontract or the performance of the Work (including with respect to disputed Changes) by negotiation, acting in good faith.

b) Notwithstanding paragraph (a), if the Contractor is involved in a dispute with the Owner or another party involved in the Project and such dispute involves or touches on the Subcontractor or the Work, the Subcontractor agrees to be joined into such dispute proceedings and shall cooperate with the Contractor and participate in such proceedings as reasonably required at its own cost.

c) The Subcontractor shall not suspend performance of the Work in the event of a Dispute.

d) This Subcontract and all matters and disputes arising from it shall be governed and interpreted by the laws of the location of the Project. The parties irrevocably attorn to the jurisdiction of the courts of the province or territory in which the Project is located, and the courts of appeal therefrom.

e) Upon achievement of substantial completion of the Subcontract (as such term is defined in the applicable Builders Lien legislation), the Subcontractor irrevocably waives all claims, disputes, rights to Changes or adjustments to the Subcontract Price and all rights of actions arising out of or in any way connected with this Subcontract (collectively "Claims") against the Contractor except (i) those Claims which have been previously notified to the Contractor in writing; and (ii) Claims arising subsequent to substantial performance.

10. **CONSEQUENTIAL DAMAGES**

Except as set out in Section 1 of this Subcontract, neither party shall be liable to the other, whether by way of indemnity or by breach of contract, tort (including negligence) or under any other theory of liability, for any consequential, punitive, special or indirect damages, whether or not such damages are foreseeable, said damages including without limitation loss of product or productivity, loss of future profit or loss of any contract, business or anticipated business that may be suffered.

11. **SAFETY**

The Subcontractor and its subcontractors and their respective employees shall comply with all Occupational Health and Safety laws and regulations applicable to the site and to the Work, and with the Contractor’s safety requirements and any other site safety requirements. The Subcontractor shall, prior to commencement of the Work on site, provide to the Contractor:

i) A copy of the Safety Manual maintained by the Subcontractor for its employees;

ii) Written safe work procedures for the Work;

iii) Proof of valid Workers Compensation insurance from applicable provincial authority; and

iv) Proof of training documentation for all workers.

12. **MISCELLANEOUS PROVISIONS**

a) **Severability and Waiver**: If any provision of this Subcontract is found to be invalid or unenforceable, neither the validity nor enforceability of any other provision of this Subcontract shall be affected or impaired. The invalid or unenforceable provision shall be severed and replaced with a valid or enforceable provision that accomplishes the same intent to the greatest extent possible. The delay or failure of a party to exercise a right or remedy under this Subcontract shall not operate as a waiver of that right or remedy. No single or partial exercise of any right or remedy precludes subsequent exercise of that or any other right or remedy.

b) **Assignment**: Neither party shall assign this Subcontract or transfer any rights or obligations under this Subcontract except with the written consent of the other party, such consent not to be unreasonably withheld or delayed. Notwithstanding the foregoing, the Subcontractor irrevocably consents to any assignment of this Subcontract as may be required by the Prime Contract.

c) **Survival of Terms**: Neither termination nor expiry of this Subcontract shall release or relieve the parties from any obligation or liability under the Subcontract which expressly or by their nature survive such termination or expiry, including without limitation:

- Section 3f (Liens)
- Section 3g (Set Off)
- Section 3h (Holdback)
- Section 7a (Indemnity)
- Section 8 (Warranty)
- Section 9 (Dispute Resolution); and
- Section 12e (Confidentiality)

d) **Cumulative Remedies**: All remedies set out in this Subcontract are cumulative and in addition to any and all other statutory, common law and equitable remedies available to a party.

e) **Confidentiality**: The Subcontractor shall keep all information (including without limitation financial information, plans, drawings, data, documents, reports and business plans) obtained due to the performance of this Subcontract or otherwise arising out of the Subcontract Work strictly confidential and shall not disclose such information except as is strictly required for the performance of this Subcontract, and such disclosure shall be on identical terms of confidentiality to this Section 12a.
1 General

1.1 PRE-ORDER AND ASSIGNMENT OF CONTRACTS

1.1.1 Owner is obtaining bids and pre-ordering products and services for work that will be assigned to Subcontractor Bidders as a part of a future bid package.

1.1.2 Include in pre-order bid price all amounts and additional costs associated with assignment of pre-ordered materials to Subcontractor.

1.2 RELATED REQUIREMENTS

1.2.1 Section 00 51 00 – Trade Contractor Agreement and General Conditions: Standard Form of Contract used to define the Construction Contract named in this Section.

1.3 DEFINITIONS

1.3.1 Assignable Contract: Owner has entered into a contract for supply of products and services using a contractor other than the Subcontractor; the terms and conditions of this Section contract will provide for the assignment of that contract to the Construction Contract.

1.4 CONTRACT ASSIGNMENT

1.4.1 Owner is exercising its right to assign products or services purchased under this Pre-Order Package to another subcontractor subject to the terms and conditions listed in the Sample Assignment Agreement Form attached to the end of this Section.

1.5 CONTRACTUAL RELATIONSHIPS

1.5.1 Products and services provided by the successful Nominated Subcontractor will be assigned to the Subcontractor responsible for the installation under the Construction Contract who will become the Assignee in the terms of the Assignment Agreement.

1.5.2 Contractual relationship will be governed by the Construction Contract upon assignment of the products and services defined by the Pre-Order Package documents.

1.6 ASSIGNMENT OF CONTRACT

1.6.1 Cost of the Pre-Order Package will be included as a Cash Allowance to cover bidding conditions required for the Construction Contract that will subsequently be used to form the acceptance of the assignment of and responsibility for the products and services required by the Pre-Order Package documents.

1.6.2 The assignment will be made as soon as the Construction Contract is awarded or as soon after as the Constructor considers practical; the assignment will be effective once the Assignment Agreement Form is completed by all listed signatories.

1.6.3 Payments that are still due to the Nominated Subcontractor after the assignment will be considered as obligations under the Construction Contract.
1.6.4 Any delays in delivery of the products and services required by the Nominated Subcontractor that occur prior to the assignment will be adjusted within the delivery requirements affecting the Pre-Order Package schedule and the schedule governing the Construction Contract so that timing of any holdback monies or commencement of warranties related to contract acceptance milestones are delivered concurrently.

2 Products
2.1 NOT USED

3 Execution
3.1 NOT USED

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SAMPLE NOVATION AGREEMENT FOLLOWS
This Agreement made this _______________ day of ___________________, by and among:

_____________________, hereinafter called "Owner".
- and -

_____________________, hereinafter called "Assignee".
- and -

_____________________, hereinafter called "Nominated Subcontractor"

WHEREAS:

4. [Owner] [Constructo] entered into a contract dated ________________, __________ with Nominated Subcontractor for performance of Work or supply of Goods and if applicable, rendering of Services, required by Contract Documents for:

(title of the Preorder Contract)

hereinafter called " Assignable Contract", which contract is intended to be assigned by [Owner] [ Constructor].
5. [Owner] [Constructo] entered into a contract dated ________________, __________ with Assignee for performance of Work required by Contract Documents for:

(title of the Prime Contract)

hereinafter called " Prime Contract".
6. Assignable Contract permits [Owner] [Constructor] to assign it and requires Nominated Subcontractor to execute this Agreement in relation to that assignment.
7. Prime Contract requires Assignee to accept assignment of Assignable Contract and to execute this Agreement in relation to that assignment.

PARTIES AGREE AS FOLLOWS:

8. The effective date of this Agreement is the _______________ day of ___________________.
9. [Owner] [Constructor] hereby assigns to Assignee, all his right, title, and interest in and to Assignable Contract and liabilities, duties, and obligations of [Owner] [Constructor] arising out of, or related to, Assignable Contract, including any unsatisfied or unperformed liabilities, duties and obligations of [Owner] [Constructor] that have so arisen or been incurred prior to effective date.
10. Assignee hereby accepts foregoing assignment of Assignable Contract and of liabilities, duties and obligations assigned to it under clause 2 above.
11. Assignee covenants with [Owner] [Constructor] and as a separate covenant with Nominated Subcontractor, to fulfill, satisfy and perform, as required by Assignable Contract, [Owner] [Constructor]'s obligations there under, including liabilities, duties and obligations assigned to it under clause 2 above, to same extent as if Assignee had been an original party to Assignable Contract.
12 Assignee shall indemnify and save harmless [Owner] [Constructor] against claims, demands, actions, suits, proceedings, damages, costs, expenses, duties, obligations, and liability of every nature and kind arising out of, or related to, Assignable Contract or performance or non-performance, including any of such claims, demands, actions, suits, proceedings, damages, costs, expenses, duties, obligations, and liability that have arisen or been incurred prior to the effective date.

13 Nominated Subcontractor hereby consents to foregoing assignment by [Owner] [Constructor] and Assignee’s acceptance, and agrees to look solely to Assignee for proper fulfillment, satisfaction and performance of [Owner] [Constructor]’s obligations, including any unsatisfied or unperformed liabilities, duties and obligations of [Owner] [Constructor] that have arisen or been incurred under it or in relation thereto prior to effective date.

14 Nominated Subcontractor covenants with Assignee to fulfill, satisfy and perform, as required by Assignable Contract, Nominated Subcontractor’s obligations.

15 Nominated Subcontractor hereby releases [Owner] [Constructor] from liabilities, duties and obligations under Assignable Contract including such of the same as may have arisen or been incurred under it or in relation thereto prior to the effective date and such of the same as may arise thereafter.

16 Parties agree that assignment, acceptance and release provided for herein shall constitute a novation wherein Assignee is, in respects in relation to Assignable Contract and any unsatisfied or unperformed liabilities, duties and obligations of [Owner] [Constructor] that may have arisen or been incurred under it or in relation thereto prior to the effective date, substituted for [Owner] [Constructor].

17 Unpaid balance of contract price for Assignable Contract, as of the effective date, is

18 Contract time for Assignable Contract, including authorized adjustments as of the effective date, is
In witness whereof the parties hereto have executed this Agreement under their respective seals and by the hands of their proper officers thereunto duly authorized.

ASSIGNEE

name of [Prime] [Trade] Contractor

signature of authorized signing officer

name and title of officer

NOMINATED SUBCONTRACTOR

name of Nominated Subcontractor

signature of authorized signing officer

name and title of officer

[OWNER] [CONSTRUCTOR] OR AUTHORIZED REPRESENTATIVE

signature

name and title
Part 1 General

1.1 REQUIREMENTS FOR TRADE CONTRACT SECURITY

.1 In the event that a bid is equal to or greater than $100,000, the Bidder must be eligible for enrolment in the Construction Manager’s Contractors Default (CDI) Insurance Program.

.2 Bidders must provide the necessary information to enable the Risk Analyst to undertake a risk assessment for the purposes of determining eligibility for enrolment in the CDI program.

.3 Although a Bidder may have been enrolled in the Construction Manager’s CDI program in the past, the Bidder may be required to provide updated information for the Risk Analyst to reassess their continued eligibility for enrolment in the program.

.4 The Bidder will not incur any costs to participate in the CDI program.

.5 The Construction Manager reserves the right to reject a Bid if the Bidder is not eligible for enrolment in the CDI program.

Part 2 Products

2.1 NOT USED

.1 Not Used.

Part 3 Execution

3.1 NOT USED

.1 Not Used.

END OF SECTION
1 General

1.1 SUMMARY

1.1.1 The following Section describes use of Construction Administration Forms and that are used in conjunction with Construction Manager and generated by the Consultant’s electronic management system (Onware).

1.1.2 The Construction Manager’s electronic management system (Aconex) will be used in conjunction with Trade Contractors.

1.2 RELATED REQUIREMENTS

1.2.1 Construction Manager’s Instructions to Bidders: Substitution request form used during the Bid Period.

1.2.2 Section 01 25 00 – Substitution Procedures: Substitution request form used throughout performance of the Work.

1.2.3 Section 01 26 13 – Requests for Information: Acceptable methods for addressing interpretations and clarifications to the Contract Documents.

1.3 CONSTRUCTION MANAGER’S FORMS

1.3.1 Construction Manager’s Forms are attached and form a part of this Section; they indicate types of forms that will be used for administration of the Contract.

1.3.1.1 Trade Contractor Prequalification Form
1.3.1.2 Certificate of Insurance
1.3.1.3 Memorandum – Instructions to Trade Contractors, Applications for Progress Claims
1.3.1.4 Sample – Progress Payment Application Form

1.4 CONSULTANT’S FORMS

1.4.1 Owner’s Forms are attached and form a part of this Section; they indicate types of forms that will be used for administration of the Contract.

1.4.1.1 Change Directive:
1.4.1.2 Etcetera

1.5 CONSULTANT’S FORMS

1.5.1 Consultant’s Forms are attached and form a part of this Section; they indicate types of forms that will be used for administration of the Contract, summarized as follows:

1.5.1.1 Change Order: Used to change the Work after completion of a Proposed Change Notice form or combination Proposed Change Notice/Change Order.
1.5.1.2 Proposed Change Notice: Used to request a Change in the Work and adjusts the Contract Price contained in the Contract; administered by the Consultant.
1.5.1.3 Certificate for Progress Payment: Used to make recommendation to the Owner by the Payment Certifier; this form is an affidavit form stating DIALOG™ (on behalf of the Owner) based on having all information available, that the Construction Manager has completed the work (or portion thereof) to date for the amounts indicated.
1.5.1.4 Construction Communication: Used where clarifications or supplementary instructions are issued, and do not change the Contract requirements a Construction Communication form will be used and administered by the Consultant.

1.5.1.5 Consultant’s Recommendation: Used when a Consultant specific discipline (Mechanical, Electrical, Structural, Architectural) working on the Project indicates that an item of the work requires attention; this form is filled out by that discipline and attached to either a Proposed Change Notice or Construction Communication form, clarifying that forms reason for issuance.

1.5.1.6 Supplemental Instruction Form: Used by the Consultant to provide an interpretation or clarification to the Contract Documents on site, with the assumption that no change to Contract Price is required by the communication.

1.5.1.7 Submittal Form: Used by Consultant to track description and transmittal history of submittals provided throughout the course of the Work.

1.5.1.8 Meeting Form: Used by Consultant to document types, location and purpose of meetings that they attend and to record subsequent action items arising from discussions.

1.5.1.9 Transmittal Form: Used by Consultant to record transmittals of documents throughout the course of the Work.

2 Products

2.1 NOT USED

3 Execution

3.1 NOT USED

REMAINDER OF PAGE LEFT INTENTIONALLY BLANK
Change Order No. 000001

Change Order Date: 
Change Order Title: 
Project Name: 
Project No.: 
Contract Title: 

To: 

This Change Order provides compensation for all costs including labour, equipment, materials, profit, overhead expenses etc. and impact, if any, on the completion date, required to complete the work described above, and is a direction to proceed.

Attachment(s): 
This Change Order is issued for the attached Proposed Change Notice(s)

<table>
<thead>
<tr>
<th>Number</th>
<th>Title</th>
<th>Date Issued</th>
<th>Amount</th>
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</thead>
<tbody>
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</tbody>
</table>

Remarks:

Issued By: 
Per: DIALOG

AMOUNT FOR CONTRACT ADJUSTMENT PURPOSES

GST

TOTAL AMOUNT

Contractor ________________________________ Date ________________________________

Owner ________________________________ Date ________________________________
New Central Library
BP3 Superstructure-Cores-Building Envelope
Project No.: 03550C01
2015-09-09 Issued for Bid

Proposed Change Notice No. 000001

Date:
Title:
Project Name:
Project No.:
Contract Title:

Attachment(s):

Submit an itemized quotation including impact, if any, on the schedule for the WORK/CHANGE described herein. THIS IS NOT DIRECTION TO PROCEED WITH THE WORK DESCRIBED HEREIN UNTIL AUTHORIZED BY CHANGE ORDER.

Description:

Reason:

Issued By:
Per: DIALOG

Distribution:
Name: Company: Fax: E-mail:

Page 1 of 1
Certificate for Progress Payment

Contractor Claim: General Contractor Invoice #?

Pursuant to the Provisions of the Contract between us and the Owner, and based on our observations at the site, and on the information made available to us, including the attached submission and declaration, we hereby certify that, in our opinion, the Contractor has completed the work to date in the amounts stipulated below.

This Certificate is prepared for the exclusive use of the Owner, and no responsibility is assumed by us for the use of this Certificate by Others.

<table>
<thead>
<tr>
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### ORIGINAL CONTRACT SUM

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### CONTRACT SUM TO DATE

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### RETENTION:

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### TOTAL RETAINED:

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<td>LESS PREVIOUS CERTIFICATES FOR PAYMENT:</td>
<td>Contract:</td>
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<td>VALUE OF WORK FOR PERIOD:</td>
<td></td>
</tr>
</tbody>
</table>

### GST

AMOUNT OF THIS CERTIFICATE

Written description of moneys

00/100 CENTS

Remarks

Before making any payment pursuant to this Certificate, please ensure that you comply with all holdback provisions of the Provincial Builders Lien Legislation. Kindly forward this office a written notification of payment to the Contractor.

Per: DIALOG

CC: (For information only)

Distribution:

<table>
<thead>
<tr>
<th>Name:</th>
<th>Company:</th>
<th>Fax:</th>
<th>E-mail:</th>
</tr>
</thead>
</table>

---

Page 1 of 1
Consultant’s Recommendation No. 000001

Date:

Regarding:

Project:

Project No.:

Proposed Change Notice:

Please Contractor as a Proposed Change Notice

Attachment(s):

Description:

Reason why this Consultant Recommendation is issued:

__________

Issued By:

Per: DIALOG

Owner

Contractor
Supplemental Instruction No. 000001

Date:
Regarding:
Project:
Project No.:

Attachment(s):

You are instructed to proceed with the following on the assumption that no change in the Contract Price is involved. Should you disagree, prior to proceeding, notify us in writing.

Description:

Issued By: 
Per: DIALOG

Distribution:
Name: Company: Fax: E-mail: 

Page 1 of 1
New Central Library
BP3 Superstructure-Cores-Building Envelope
Project No.: 03550C01
2015-09-09 Issued for Bid

Submittal No.

Title:
Project:
Project No.:
Division:
Number:
Type:
Cross Reference:
Priority:
Required By:

Description

Transmittal History
Meeting No. 000001

Project:
Project No:
Meeting Date:
Location:
Purpose:

Items discussed:

Present:  Firm/Name  E-mail

Contractor

<table>
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<th>ITEMS</th>
<th>ACTION</th>
<th>REQ'D BY</th>
</tr>
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</table>

These notes are considered to be an accurate account of the meeting. If any discrepancies or omissions are noted, please contact the undersigned; otherwise these shall be deemed acceptable to all.
**Construction Communication No. 000001**

---

**Date:**

**Regarding:**

**Project:**

**Project No.:**

---

**Attachment(s):**

You are instructed to proceed with the following on the assumption that no change in the Contract Price is involved. Should you disagree, prior to proceeding, notify us in writing.

**Description:**

---

**Issued By:**

Per: DIALOG

---

**Distribution:**

**Name:** Company: Fax: E-mail:
Transmittal No. 000001

Date:

Project:

Project No.:

To:

CC:

CC:

Carrier:

Waybill:

Comments:

Per: DIALOG
Substitution Request Form during Construction

Date: 
Project Name: 
Project No.: 
Contract Title: 

Constructor’s Request must be accompanied by supporting data. Coordinate substitution request with DIALOG’s acceptance requirements and limitations listed in Section 01 25 00 – Substitution Procedures and complete the following information:

Specification Section Number:  
Specification Title:  

- Product Data for Proposed Substitution: Consisting of manufacturers product information, listing of appropriate reference standards, and performance and testing results
- Sample: Accompany substitution request with samples or small scale mock-ups of Proposed Substitution where appropriate, and where sample can assist DIALOG with assessing material or assembly properties.

Itemized comparison between Proposed Substitution and Specified Products, attach additional sheets as required where space provided is not sufficient:

<table>
<thead>
<tr>
<th>Specified Products</th>
<th>Proposed Substitution</th>
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<td>Significant Matching Properties:</td>
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<td>Significant Variations:</td>
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<td>Reason for Substitution:</td>
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<td>Effect on Other Parts of the Work:</td>
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<td>Substitution: $</td>
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<tr>
<td>Increase Contract Time by:</td>
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</tr>
</tbody>
</table>

Submission of Proposed Substitution is not a direction to proceed with affected work, and does not constitute a change to Contract Price or extension to Contract Time until authorized by Change Order.
1 General

1.1 INTENT

.1 The intent of this Section and all subsequent Division 01 – General Requirements sections is that they relate directly to the Trade Contractor and shall be read in conjunction with the technical Specification Sections in Divisions 02 to 50.

.2 Division 01 – General Requirements provide detailed administrative requirements to the Trade Contractor, and assigns responsibilities and duties to the Trade Contractor and Construction Manager.

.3 The Construction Manager and Consultant have jointly prepared these documents; direct any questions arising from their use, to the Construction Manager.

.4 These documents are addressed to the Sub-Contractor, and outline the administrative and procedural requirements for the project. The Construction Manager and Consultant will not accept any claims for extra work arising from the Sub-Contractor’s failure to read, understand and incorporate the requirements of Division 01 – General Requirements, into their work.

1.2 CONSTRUCTION MANAGEMENT

.1 This project is being constructed under the Construction Management System. Refer to the General Conditions of Agreement between the Owner and Construction Manager for additional information.

.2 The Construction Manager will provide full-time site administration to ensure that all Sub-Contractors coordinate their work with other Sub-Contractors and to ensure maintenance of the established Construction Schedule.

.3 The Construction Manager is responsible to ensure compliance by the various Sub-Contractors with the applicable general requirements of the individual Specification Sections contained in the Project Manual.

.4 Each Sub-Contractor must cooperate fully with the Construction Manager and with all other Sub-Contractors.

.5 If a Sub-Contractor considers that there is a lack of cooperation on the part of any other Sub-Contractor, promptly inform the Construction Manager in writing.

1.3 WORK OF THIS TRADE PACKAGE

.1 Attaining Substantial Performance of the Work within the times specified in the Construction Manager’s Construction Schedule is of prime importance to the Owner. To ensure that the Construction Schedule is met:

   .1 The New Central Library project is a LEED Gold project. The subcontractors on the project will be required to adhere to the LEED specification requirements and site requirements relating to a LEED Gold project.

   .2 Sub-Contractors shall be required to employ special measures to arrange for and ensure the availability of labour, products and construction machinery and equipment when and as required.
.3 Sub-Contractors shall be required to allow for premium time (including overtime and double shifting) for their workforce as required to meet the Construction Manager’s Schedule.

.4 The Construction Manager will provide two – luffing jib tower cranes to assist Sub-Contractors with hoisting and off-loading for the duration shown in the construction schedule. If hoisting is required at a time when the crane operators are not on-site (ie. Night deliveries, etc.), the Sub-Contractor shall pay for all costs associated with using the tower cranes during this time or provide alternate means of hoisting. The tower crane specifications and layout drawing are included for reference by the bidders.

.2 Sub-Contractors will be responsible for delivery and offloading of materials and equipment to the loading area, and material handling to area of construction except as otherwise indicated by the Construction Manager. Sub-Contractors must schedule deliveries at predetermined times to enable materials and equipment to be transported within the Construction area. Make arrangements with the Construction Manager a minimum of 24 hours in advance of requirements for loading or unloading of materials. Mobile equipment tires/treads must be clean when maneuvering on roadways.

.3 Sub-Contractors are responsible for all equipment, scaffolding, hoisting/cranes, trucking and transportation required to complete their work. There is very limited space available on site for a subcontractor trailers and storage sheds. Requests for site trailer and storage facility space must be submitted to the Construction Manager for review and approval.

.4 The Construction Manager will provide power and general site lighting. Sub-Contractors are responsible for providing task specific lighting.

.5 Sub-Contractors are responsible to clean up their scope of work and place their waste into garbage bins as supplied and removed by the Construction Manager.

.6 Sub-Contractors are required to obtain, from the Construction Manager, hot work permits for all work with open flame, brazing, grinding, welding, heating or hot guns.

.7 Sub-Contractors are required to provide their own off-site parking for the Sub-Contractors’ staff as required.

.8 Controls for building layout will be provided by the Construction Manager.

.9 The Construction Manager will provide the garbage bins, general washroom facilities and construction perimeter fencing (fencing cannot be removed or relocated unless authorized by the Construction Manager).

.10 Sub-Contractors will be liable for any damage they cause to the work of other Trades and must provide proper protection of all affected trades’ work.

.11 Work of the Trade Package comprises of all work required of the Contract Documents. The scope of the work is the work described in the contract documents. The scope of this contract includes, but is not limited to, the supply and installation of all materials, systems and accessories required to complete the work described in the Trade Documents.

.12 The work of this trade package will be coordinated with the final completion of the LRT encapsulation work which will be substantially complete when this work commences.

.13 Notwithstanding the above, this Trade Package includes, but is not limited to, the following work:
.1 Concrete Formwork

.1 Supply and install of all formwork systems including design as described in section 03 11 00 for the following CIP concrete elements:

.1 Structural slab on level 0 (except the structural slab above the cistern which was completed under BP#1)

.2 Floating slabs on level 0, including the isolation pads under the floating slabs and raker beams

.3 Grade beams 42, 43, 44 (all other grade beams completed under BP#1)

.4 Core walls from the level 0 raft slab to the roof (base slabs completed under BP#1)

.5 Core wall CIP stairs and landings. Cast in place stair nosing installation by this trade scope (supply by others)

.6 Structural framing for theatre seating including upstands and seating (supply of metal angle and supply and install of metal deck by other trades)

.7 Columns, suspended slabs, beams and purlins. All pour breaks to be reviewed and approved by the structural engineer. Concrete formwork and pouring to be coordinated with the mechanical, electrical, reinforcing steel and structural steel subcontractors through the construction manager. There are numerous electrical, mechanical and structural steel systems embedded in the concrete on this project which must be sequenced and coordinated effectively. Concrete formwork bidders are responsible for review of the architectural, mechanical and electrical drawings in order to understand the design.

.8 All exposed columns will be an architectural concrete finish. All suspended slabs, purlins and beams will be an architectural concrete finish on the underside of level three, level four and the roof level. The formwork subcontractor will be responsible for protection, repair and replacement of all architecturally exposed concrete by damages from their own forces or their subcontracted forces, until such time as they are no long near or affecting the architecturally exposed concrete. At this time the Construction Manager and the formwork subcontractor will agree and sign off on what areas will be turned over to the CM, who will then be responsible for protection and repair of the architecturally exposed concrete surfaces/areas identified. The formwork subcontractor will be responsible for preventing the bleeding of formwork or over pouring of concrete onto architecturally exposed concrete. In the event that this does occur the formwork subcontractor will be responsible for cleaning the concrete immediately.

.9 All upstand curbs, suspended slabs with built up insulation including but not limited to washrooms, the penthouse and loading dock areas.

.10 Housekeeping pads as noted on the architectural, mechanical and electrical drawings.

.2 Include all necessary chamfered corners (UNO), construction and control joints, dovetail anchor slots, built up insulation, flashing reglets and form spacers.
.3 Include install only of all void forms/insulation and waterstops. Supply will be by the Construction Manager.

.4 Include install of all steel rods, inserts and embeds. Supply of embeds by Div 5.

.5 Include all required block-outs and bulkheads.

.6 Include all snow removal from formwork and decks until the concrete component or slab has been poured.

.7 Include concrete placing to all vertical elements and slabs.
   .1 Include all required patching to concrete placed as part of their scope.

.8 Winter heat and hoard will be provided by the Construction Manager.

.9 The installation sequence will coordinated with the other subcontractors through the Construction Manager as per the Construction Manager’s schedule.

.10 Please Note: The concrete formwork subcontractor must provide evidence of projects, personnel and references where architectural concrete was completed successfully by their company. Refer to section 03 33 00 relating to architecturally exposed concrete to ensure that the projects previously completed met the requirements of the current specification.

.2 Reinforcing Steel

.1 Supply and install of all reinforcing steel as described in section 03 20 00 for the following CIP concrete elements:
   .1 Structural slab on level 0 (except the structural slab above the cistern which was completed under BP#1)
   .2 Floating slabs on level 0
   .3 Grade beams 42, 43, 44 (all other grade beams completed under BP#1)
   .4 Core walls from the level 0 raft slab to the roof (base slabs completed under BP#1)
   .5 Core wall CIP stairs and landings
   .6 Structural framing for theatre seating including upstands and seating
   .7 Columns, suspended slabs, beams and purlins. All pour breaks to be reviewed and approved by the structural engineer. Rebar installation to be coordinated with the mechanical, electrical and structural steel subcontractors through the construction manager.
   .8 All upstand curbs and suspended slabs including but not limited to washrooms, the penthouse and loading dock areas.
   .9 Housekeeping pads as noted on the architectural, mechanical and electrical drawings.
.10 Please note that the reinforcing steel subcontractor will be responsible for the cost of repairing or replacing architecturally exposed concrete formwork due to damage from this subcontractor.

.2 Supply all dowels for masonry walls. Install of masonry dowels will be by the construction manager.

.3 Include all required chairs, bolsters, supports, and spacers.

.4 The reinforcing steel subcontractor will be required to coordinate their rebar installation with the pour break schedule of the formwork subcontractor, and the installation sequence and schedule of the mechanical, electrical and structural steel systems within the concrete components.

.3 Concrete Supply

.1 Concrete supply for the complete project was tendered and awarded previously under BP#1.

.4 Precast Architectural Concrete

.1 Supply and install of all precast architectural concrete as described in section 03 45 00 for the following elements:

.1 WT 15 exterior wall panels as indicated on the architectural elevation drawings
.2 Wall panels shown on the landscaping drawings to match the WT 15 wall panels on the building
.3 Additional precast architectural concrete components shown on the landscaping drawings are not included in this package and will be tendered at a later date.

.2 Supply and install all connections relating to the fastening of the precast architectural wall panels

.3 Supply and install the vapour barrier, insulation and Z girt system in the locations behind the precast architectural panels.

.5 Structural Steel

.1 Please note: Bids will only be accepted from previously PREQUALIFIED SUBCONTRACTORS as per the RFQ that closed on July 30th, 2015.

.2 Supply and install of all structural steel as described in section 05 12 00 for the following elements:

.1 Structural steel columns, beams and purlins
.2 Structural steel framing for stairs at North tip of the building
.3 Structural steel truss
.4 PTFE bearing pads underneath truss members
.5 Structural steel support members for curtain wall connections
.6 Parapet structural steel as noted on the structural and architectural drawings
.3 Supply embed plates that are to be cast into the following concrete elements:

.1 Structural slabs from level 0 to roof
.2 Core walls from level 0 to roof
.3 Concrete columns, beams and purlins from level 0 to roof

.4 Install embed pates by others.

.5 Design, supply and installation of all falseworks and temporary support required for the structural steel installation. Temporary support design to be reviewed and approved by the project engineer and construction manager. The CM has installed structural piling below each location of the vertical member of truss 1 (one) and truss (four) for use by the structural steel contractor for temporary erection. Truss 5 (five) cannot be temporarily supported from below.

.6 The structural steel subcontractor will be required to coordinate the structural steel installation with the concrete formwork installation and the associated systems installed within the concrete components though the Construction Manager.

.7 If the structural steel subcontractor is submitting a bid price for the miscellaneous metals or metal deck, a separate price must be submitted for these scopes.

.8 Any mobile cranes required by the structural steel subcontractor beyond the tower cranes supplied by the construction manager will be at the structural steel subcontractor's expense. The positioning and lifting operations for mobile cranes must be reviewed and approved by the construction manager in coordination with the tower crane operation.

.6 Steel Deck

.1 Supply and install of all steel deck as described in section 05 31 00 for the following elements:

.1 General steel decking as noted on the structural drawings (the sequence and timing for the steel deck installation will be coordinated with the construction manager as per the construction manager's schedule)

.2 Steel decking for theatre seating

.2 If the structural steel subcontractor is submitting a bid price for the steel deck a separate bid form and price must be submitted.

.7 Exterior Miscellaneous Metals

.1 Supply and install of all miscellaneous metals as described in section 05 50 13 for the following elements:

.1 Support angles for door sills
.2 Elevator machine beams
.3 Steel framing for all exterior door openings
.4 Steel angle frame for support of dock bumpers
.5 Steel edge framing for concrete slabs

.6 Loading dock edge angles

.7 Steel floor plate supports

.8 Theatre seating angle framing

.8 Sprayed Insulation

.1 Supply and install of all sprayed insulation as described in section 07 21 29 for the following elements:

.1 Sprayed insulation to the underside of level two above the wood soffit

.2 Sprayed insulation to the underside of level one above the loading dock door soffit

.9 Metal Wall Cladding & Louvres

.1 Supply and install of all metal wall cladding and louvres as described in section 07 42 13 and 08 90 00 for the following elements:

.1 Wall type WT11 as shown on the architectural drawings

.2 Supply and install the vapour barrier, insulation and Z girt system in the locations behind the WT11 panels.

.3 6 (six) mechanical louvres on the mechanical penthouse

.4 1 (one) mechanical louvre on level 0 on the South elevation for the emergency generator room

.10 Roofing

.1 Supply and install of all roofing components as described in section 07 42 43, section 07 62 00, section 07 72 33 and section 07 21 13 for the following elements:

.1 Roof types R01, R02, R03, R03a, R04 and R05 including all insulation and vapour barrier assemblies

.2 All parapet cap flashing and all vertical pre-finished metal flashing (not including WT11) on the back side of all parapets (color and finish to be coordinated with the metal panel color and finish schedule)

.3 All roof hatches to be included in this scope of work

.11 Overhead Coiling Doors

.1 Supply and install of the overhead coiling doors as described in section 08 33 23 for the following elements:

.1 4 (four) doors in the loading dock area

.12 Curtain Wall, Composite Panel, Wood Soffit, Solar Fins and Exterior Glazing
.1 The scopes of work for Composite Panels 07 42 43, Glazed Aluminum Curtain Walls 08 44 13, Solar Fins 05 75 00 and Glass Glazing 08 81 00 have already been awarded under a design assist RFP and are included for reference only.

.13 Building Maintenance Equipment

.1 Supply and install of all building maintenance equipment as described in section 11 24 23.

.14 Waterproofing

.1 Supply and install of all waterproofing/insulation as described in section 07 16 16, 07 21 13, 07 25 13 for the following elements:

.1 Elevator pits
.2 Sump pits
.3 Interior cistern
.4 Below grade foundation wall/grade beam

1.4 RESPONSIBILITY FOR EXISTING PROPERTY

.1 The Construction Manager assumes responsibility for the overall Project.

.2 Trade Contractors assume responsibility for care, custody and control of property, which is assigned to them for performance of the Work by the Construction Manager.

.3 Trade Contractors assume responsibility for, and shall make good, damage to existing property attributable to the performance of their assigned work.

1.5 CONTRACT TIME

.1 The date of commencement of the Contract is the date of issuance of the Letter of Acceptance by the Construction Manager.

.2 The Trade Contractor is to provide at the time of bid the long lead delivery time for all equipment included in the Trade Contractor’s scope of work.

.3 The Construction Schedule as provided by the Construction Manager is for general reference only and will be coordinated with the successful Trade Contractor in regards to equipment delivery dates and confirmed commissioning durations.

.4 Upon receipt of the Letter of Acceptance, promptly, and without undue delay, commence work at the Place of the Work as directed by the Construction Manager in accordance with the Construction Schedule.

.5 Attain Substantial Performance of the Work in accordance with the Construction Manager’s Construction Schedule.

.6 The Construction Manager may adjust the Construction Schedule from time to time. Trade Contractors must submit, in writing, any affect that this adjustment has on the Work of their Contract.
1.6 TRADE CONTRACTOR’S USE OF PREMISES

.1 Trade Contractors must recognize that other contract work will be ongoing on the project site. Access will be limited to the predetermined routes and areas of construction.

1.7 CONSTRUCTION MANAGER’S SUPERVISION

.1 The Construction Manager will provide supervision on the site at all times that work is being performed.

.2 All work by the Trade Contractor on the NCL project site will be completed during regular work hours, unless coordinated with the Construction Manager.
2.4.1 Table of load carrying capacity WOLFF 355 B (1 fall operation)

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The load carrying capacity is related to a tower height of 40.5 m. Tower heights greater than that reduce the maximum load carrying capacity by the weight of the additional hoisting ropes (one fall operation = 3.25 kg per meter of the hook range).
2.4.2 Table of load carrying capacities (kg) in meter intervals, WOLFF 355 B (1 fall operation)

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1 General

1.1 INTENT

1.1.1 The intent of this section and all subsequent Division 01 – General Requirements Sections is that they relate directly to the Trade Contractor and are intended to be read in conjunction with the following:

1.1.1.1 Phase specific Division 01 Sections issued with each Tender Package
1.1.1.2 Technical Specification Sections contained in Divisions 02 through 33 issued with each Tender Package

1.1.2 Division 01 – General Requirements provide detailed administrative requirements to the Trade Contractor, and assigns responsibilities and duties to the Trade Contractor and Construction Manager.

1.1.3 Construction Manager and Consultant have jointly prepared these documents, direct any questions arising from their use to the Construction Manager.

1.1.4 These documents are addressed to the Trade Contractor, and outline the administrative and procedural requirements for the project. The Construction Manager and the Consultant will not accept any claims for extra work arising from the Trade Contractor’s failure to read, understand and incorporate the requirements of Division 01 – General Requirements into their work.

1.2 RELATED REQUIREMENTS

1.2.1 Trade Contractor will be bound by their Subcontract to General Conditions and Supplementary Conditions of the Construction Manager’s agreement with the Owner.

1.2.2 Construction Manager’s Trade Contractor Agreement and General Conditions and Supplementary Conditions: Additional requirements affecting Trade Contractor, including appendices and supplementary conditions, if any.

1.2.3 Section 01 31 13 – Project Coordination: Construction Manager’s administration requirements.

1.2.4 Section 01 73 00 – Execution

1.3 DEFINITIONS

1.3.1 Tender Package: Individual, easily identifiable packages of work forming a part of the total Work for the Project, which may be broken down into small packages by the Construction Manager to facilitate the acquisition of Bids for each Tender Package.

1.3.2 Owner: The Owner (Calgary Municipal Land Corporation) is the person, firm or corporation identified as such in the Agreement and is referred to throughout the Contract Documents as if singular in number, with no reference to gender. The term Owner is inclusive of their authorized agent or representative as defined to the Construction Manager in writing.

1.3.3 Consultant: The Consultant (DIALOG) is the person, firm or corporation identified as such in the Agreement, and is an architect or engineer licensed to practice in the province or territory of the Place of the Project, and is referred to in the Contract Documents as if singular in number and with no reference to gender.
1.3.4 Construction Manager: The Construction Manager (Stuart Olson Dominion) is the person, firm or corporation identified as such in the Agreement, and is referred to in the Contract Documents as if singular in number and with no reference to gender. The term Construction Manager is inclusive of their authorized agent or representative as defined to the Owner in writing.

1.3.5 Trade Contractor: The Trade Contractor is a person, firm or corporation having a direct contract with the Construction Manager to perform the Work. The term Trade Contractor is referred to in the Contract Documents as if singular in number and with no reference to gender. Terms such as Trade Contractor, sub-Trade Contractor and similar references will be taken to mean the Trade Contractor.

1.3.6 The Project: The Project means the total construction and related services managed under the Contract of which the Trade Contractor’s Work is a part.

1.3.7 The Work: The Work means that portion of the Project performed by the Trade Contractor or by the Construction Manager directly using their own forces.

1.3.8 Place of the Project: The Place of the Project is the designated site or location of the Project for the New Central Library, located at Calgary, Alberta.

1.3.9 Contract Time: The Contract Time is the time stipulated in by the Construction Manager in the Agreement Form made with the Trade Contractor. Further, Day means calendar day; working day means days other than Saturday, Sunday and holidays observed by the construction industry in the area of the Place of the Project.

1.3.10 Substantial Performance of the Project: Substantial Performance of the Project is the date when the total construction contemplated by the Project is sufficiently complete in accordance with the Contract Documents and as defined in the Lien Act applicable to the Place of the Work. Substantial Performance for individual Trade Contractors will be defined as the same as Substantial Performance of the Project.

1.3.11 Total Performance of the Project: Total Performance of the Project is the date when the total construction and related services contemplated by the Project have been performed to the requirements of the Contract Documents and as defined in the Lien Act applicable and ready for final acceptance.

1.3.12 Changes in the Project: Changes in the Project means additions, deletions, or other revisions to the Project within the general scope of the Contract; valuation for changes to the work are identified in the Owner’s General Conditions and Supplementary Conditions of Contract.

1.3.13 Quality Assurance and Quality Control: Quality Assurance and Quality Control are defined within Division 01 requirements and the Construction Manager’s Project Quality Control Plan.

1.4 CONSTRUCTION MANAGEMENT CONTRACT

1.4.1 The project is being constructed under the Construction Management System of Project Delivery with the Construction Manager forming Subcontracts directly with Trade Contractors on behalf of the Owner.

1.4.2 Construction Manager will provide full-time site administration to ensure that all Trade Contractors coordinate their work with other Trade Contractors and to maintain the Construction Schedule.
1.4.3 Each Trade Contractor shall cooperate fully with the Construction Manager and with all other Trade Contractors.

1.4.4 Any Trade Contractor who considers that there is a lack of cooperation on the part of any other Trade Contractor shall promptly inform the Construction Manager in writing.

1.5 WORK OF THE PROJECT

1.5.1 Work of the Project comprises the construction required for the New Central Library, which has been divided into several Tender Packages that will form a part of the total Work required to complete the Project.

1.5.2 Proposed Tender Packages issued by Construction Manager will be Bid and awarded at dates established by the Construction Manager, coordinate with Construction Manager for requirements that may apply to or affect the Work of different Tender Package Packages.

2 Products

2.1 WORK OF THE CONTRACT

2.1.1 Attaining Substantial Performance of the Work within the times specified in the Construction Manager’s Construction Schedule is of prime importance to the Owner.

2.1.2 To ensure that the Construction Schedule is met:

2.1.2.1 Trade Contractor may be required to employ special measures to arrange for and ensure the availability of labour, products and construction machinery and equipment when and as required.

2.1.2.2 Trade Contractor may be required to allow for premium time (including overtime and double shifting) for their workforce as required to meet Construction Manager’s Schedule.

2.1.3 Trade Contractor will be responsible for delivery and offloading of materials and equipment to the loading area, and material handling to area of construction, except as otherwise indicated by the Construction Manager. Trade Contractor will be expected to schedule deliveries at predetermined times to enable materials and equipment to be transported within the construction area. Trade Contractors shall make arrangements with Construction Manager a minimum of 24 hours in advance of requirement for loading or unloading of materials.

2.1.4 Trade Contractors will be responsible to provide all scaffold or equipment required to gain access to and perform their work.

2.1.5 All Trade Contractors and suppliers are responsible to obtain their own site measurements, including site confirmation of dimensions provided on the drawings.

2.1.6 All related sleeving, cutting and patching associated with completion of Trade Contractors’ scopes of work will be the responsibility of Trade Contractors. Trade Contractor shall coordinate placing of sleeving, cutting and coring with other affected trades and the Construction Manager.

2.1.7 All room and board required by workers to complete Trade Contractors’ scope of work will be the responsibility of Trade Contractors.
2.1.8 All trucking and transportation required by Trade Contractor to complete their work will be the responsibility of Trade Contractor.

2.1.9 Trade Contractor will be liable for any damage it causes to the work of other trades. Proper protection of other trades' work shall be undertaken by the individual Trade Contractors.

2.1.10 Work of each Tender Package comprises all work required for the whole Project, not necessarily the work described in each package. Work from each Tender Package shall be continuous through each stage or phase of the Construction Manager’s construction schedule.

2.1.11 The scope of work for each Tender Package is described in the Contract Documents relating to the package of work. The scope of this contract includes; but is not limited to, the supply and installation of all materials, systems and accessories required to complete the work described in the individual Tender Packages.

2.2 TRADE CONTRACTOR’S USE OF PREMISES

2.2.1 Trade Contractor shall have partial use of premises for performance of the Work as directed by the Construction Manager.

2.2.2 Trade Contractor shall limit their use of premises to the following:

2.2.2.1 Areas of work established by the Construction Manager construction schedule and phasing plan.

2.2.2.2 Construction Manager will establish and maintain fire exits.

2.2.2.3 Trade Contractors shall keep fire exit routes clear of debris and equipment through areas of Work until completion of the Work.

2.2.3 Trade Contractor shall limit their use of premises to allow for:

2.2.3.1 Work of Other Trade Contractors.

2.2.3.2 Instructions from the Construction Manager.

2.3 RESPONSIBILITY FOR EXISTING PROPERTY

2.3.1 Construction Manager will assume responsibility for the overall Project.

2.3.2 Trade Contractor shall assume responsibility for the care, custody and control of property which is assigned to them for performance of the Work by the Construction Manager.

2.3.3 Trade Contractor shall assume responsibility for and shall make good damage to existing property attributable to their performance of Work of this Contract.

3 Execution

3.1 ROADS, CURBS, GUTTERS, AND SIDEWALKS

3.1.1 Construction Manager will be responsible for the following in connection with roads, curbs, gutters and sidewalks occurring outside property lines, and shall assign specific duties to individual Trade Contractors:

3.1.1.1 Work required to be done to existing roads, curbs, gutters, and sidewalks.

3.1.1.2 Connecting new and existing roads, curbs, gutters and sidewalks.
3.1.1.3 Provision of new roads, curbs, gutters and sidewalks, and portions thereof.
3.1.1.4 Making good of damage to existing roads, curbs, gutters and sidewalks caused by Work of this Contract.

3.1.2 Construction Manager has made arrangements for payment of costs and charges levied by and comply with requirements of authorities having jurisdiction.

3.2 ROOFING AND WATERPROOFING

3.2.1 No work on roof or waterproofing areas shall be carried out without the prior authorization of the Construction Manager’s superintendent.

3.2.2 Trade Contractor must provide and maintain proper protection for the safety of the Work and the workers thereon at all times.

3.2.3 Any damage caused by failure to provide the required protection will be charged to the responsible Trade Contractor.

3.3 CONTRACT TIME

3.3.1 Date of commencement of the Contract shall be the date of issuance of the Stuart Olson Dominion Construction Ltd. Subcontract by the Construction Manager.

3.3.2 Upon receipt of Stuart Olson Construction Ltd. Subcontract, promptly, and without undue delay, commence work at the Place of the Work as directed by the Construction Manager in accordance with Construction Schedule.

3.3.3 Attain Substantial Completion of the Work in accordance with the Construction Manager’s Construction Schedule.

3.3.4 Construction Manager may adjust the Construction Schedule from time to time; Trade Contractor will submit in writing any affect that this adjustment has on work of their contract.

3.4 PERMITS AND FEES

3.4.1 Trade Contractor’s shall make arrangements with, pay costs and charges levied by and comply with requirements of authorities having jurisdiction.

3.5 TRADE CONTRACTOR’S USE OF PREMISES

3.5.1 Trade Contractor shall recognize that other contract work will be ongoing on the project site.

3.5.2 Access will be limited to the predetermined routes and areas of construction.

3.6 CONSTRUCTION MANAGER SUPERVISION

3.6.1 Construction Manager is required to have supervision on site at all times that work is being performed.

3.6.2 This requirement may be waived where overtime work is directed by the Construction Manager.
3.7 SPECIFICATION FORMATS AND CONVENTIONS

3.7.1 Specification Format: The specifications are based on MasterFormat jointly published by Construction Specifications Canada (CSC) and Construction Specifications Institute (CSI) using the 2014 updated master list of numbers and titles that classify work results or construction practices:

3.7.1.1 Section Identification: The Specifications use section numbers and titles to help cross-referencing in the Contract Documents.
3.7.1.2 Sections in the Project Manual are in numeric sequence; however, the sequence is incomplete and not intended to be read as a continuous and sequential page-by-page requirement.
3.7.1.3 Consult the table of contents at the beginning of the Project Manual to determine numbers and names of sections in the Contract Documents.
3.7.1.4 The section numbers do not, and cannot indicate the scope of work for individual Trade Contractors (trade scope of work), they are used to establish the total work required for the Project.

3.7.2 MasterFormat is primarily used to organize project manuals, organize detailed cost information and relate drawing notations to the specifications.

3.7.3 The 6 Number, 50 Division format replaces the previous 5 Number, 16 Division format used before 2004.

3.7.4 Specification Content: The Specifications use certain conventions for the style of language and the intended meaning of certain terms, words, and phrases when used in particular situations. These conventions are as follows:

3.7.4.1 Related Requirements: Related requirements listed in the specifications indicating specification sections that are related to work of the section do not create a trade scope of work:

3.7.4.1.1 Related requirements are provided to indicate closely coordinated requirements during preparation of the documents and that may aid the Trade Contractor in fully incorporating components relating to their trade scope of work.
3.7.4.1.2 Trade Contractors are expected to coordinate with sections affecting their work and ensure that trade scope of work is fully accounted for, including requirements of Division 00 and 01 and other sections that may not be listed in the listings associated with related requirements.

3.7.4.2 Laws, Statutes, Codes and Reference Standards: Dated reference standards listed in the Specifications generally reflect the version used to establish the performance requirements for the work described:

3.7.4.2.1 Reference to any provincial or national statutes and codes includes the full content of the code or statute including and amendment, revision or consolidation published by the Authority Having Jurisdiction.
3.7.4.2.2 Dated reference standards listed in provincial or national codes or statutes apply to the Work of the Contract.
3.7.4.2.3 Dated reference standards listed in provincial codes or statutes govern where an older or newer version of a reference standard is listed in the Specifications.
3.7.4.3 Abbreviated Language: Language used in the Specifications and other Contract Documents is abbreviated to aid interpretation of the documents:

3.7.4.3.1 Words and meanings shall be interpreted as appropriate and are intended to be read as a whole, not extracted and read individually.

3.7.4.3.2 Words implied but not stated, shall be inferred as the sense requires.

3.7.4.4 Imperative Mood and Streamlined Language: Generally used in the Specifications to avoid assigning specific responsibilities to the Construction Manager or the Trade Contractor that affect trade scopes of work:

3.7.4.4.1 Requirements expressed in the imperative mood are to be performed by Trade Contractors.

3.7.4.4.2 Occasionally, the indicative or subjunctive mood may be used in the Section Text for clarity to describe responsibilities that must be fulfilled indirectly by Trade Contractors or by others when so noted.

3.7.4.5 Use of Shall and Will: Use of the words shall and will is minimized throughout the specification, but are used to indicate preferred directives to the Construction Manager and Trade Contractor where greater clarity to the documentation is achieved using those words:

3.7.4.5.1 For the purposes of this Contract, the word “shall” is a directive requiring that the Trade Contractor undertake a specific task or assignment.

3.7.4.5.2 For the purposes of this Contract, the word “will” is a directive indicating an action or task required by the Owner, and Consultant and Construction Manager.

3.7.4.6 Use of Singular and Plural Words: The language of the Specifications is essentially plural, and usage of singular and plural words is governed as follows:

3.7.4.6.1 Every attempt has been made to apply singular and plural word usage based on numbers of components required by the project; however, it is expected that use of singular and plural words will be interpreted in context to what the Contract Documents indicate.

3.7.4.6.2 The use of plural words when ascribed to a singular requirement shall be reasonably interpreted as relating to a singular requirement when a count of components described by the plural word indicates a single occurrence.

3.7.4.6.3 The use of a singular word version when ascribed to multiple requirements shall be reasonably interpreted as relating to multiple requirements when a count of components described by the singular word indicates multiple occurrences.

3.7.4.7 Use of Gender Specific Words: The language of the Specifications is generally written as nouns arising from the Contract and that relate to the partnerships, firms or corporations involved and generally avoid the use of gender specific pronouns where ever possible:

3.7.4.8
Words describing gender and that relate to the partnerships, firms and corporations can be interpreted as relating to the Construction Manager and Trade Contractor as defined by the Contract within the context of what the Contract Documents require for those parties.

END OF SECTION
1 General

1.1 SUMMARY

1.1.1 This Section includes requirements permitting Trade Contractor to propose substitutions for consideration by the Consultant that offer means or methods that differ from those indicated by the Consultant.

1.1.2 This Section recognizes the Trade Contractor’s control over the work allows for proprietary or unique solutions to the conceptual of the Consultant’s requirements indicated on the Drawings and within the Specifications.

1.2 RELATED REQUIREMENTS

1.2.1 Construction Manager’s Instructions to Bidders: Requests for Substitutions during Bid Period.

1.2.2 Construction Manager’s Procurement Form Submittals: Procurement Form for Trade Contractor Proposed Substitutions during Bidding Period for specific Tender Packages.

1.2.3 Construction Manager’s Alternates: Acceptance of identified alternates for specific work as an add or delete price to the Contract proposed during Bid Period and accepted for inclusion in Contract Price for specific Tender Packages.

1.2.4 Section 01 35 31 LEED Special Project Procedures: LEED forming a part of product selection criteria.

1.2.5 Section 01 62 00 – Product Options: Trade Contractor’s options for selecting specified products, materials, systems or assemblies.

1.3 DEFINITIONS

1.3.1 Acceptable Materials: The term Acceptable Materials is used to specify products by material name, manufacturer, catalogue number, model number, or similar reference and is used as follows:

1.3.1.1 Acceptable Materials listings are based on the Consultant’s determination that materials meet specified requirements and opinion of applicability to the project requirements.

1.3.1.2 Acceptable Materials listings are deemed to establish the standard of acceptance that the Consultant will consider appropriate for the Work.

1.3.1.3 Any product listed in the Acceptable Materials listing may be used to establish the Bid Price.

1.3.2 Alternates: Consultant identified separately priced materials, assemblies or deliverables that provide options to the Owner in determining what the Work of a contract will actually consist of; submission of alternate pricing during Bid Period will not constitute acceptance of the alternate material, assembly or deliverable, acceptance will be based on Base Bid price as further described in Section 01 23 00 where Tender Packages require Alternate Prices.

1.3.3 Base Bid: Preference will be given to Bids based on materials, assemblies or deliverables described in the Technical Specifications without adjustment for Alternate Price Bids; consideration for acceptance of pricing will not be made on alternate prices, but will be based on the Base Bid price to maintain fairness for Bidders that do not have the means to provide an Alternate Price Bid.
1.3.4 Basis-of-Design Materials: The term Basis-of-Design Materials is used to specify a specific material name, manufacturer, catalogue number, model number or similar reference and is used as follows:

1.3.4.1 Basis-of-Design Materials are used to establish Consultant’s preference for a single source product listing based on performance, appearance or configuration.

1.3.4.2 Use the Basis-of-Design Material to establish the Bid Price, unless an Addendum is issued adding additional Acceptable Materials.

1.3.4.3 Basis-of-Design Materials designation does not limit the Trade Contractor’s ability to submit Proposed Substitutions in accordance with Substitutions requirements of this Section and specific performance requirements listed in Technical Specification Sections.

1.3.5 Substitutions: Materials that in the opinion of the Trade Contractor meets requirements of the named Acceptable Materials or Basis-of-Design Materials listing in the Technical Specifications of the Project Manual, and are submitted to the Consultant as required by this Section for consideration for use in the Project.

1.3.5.1 Unsolicited Substitutions: Substitutions presented by Trade Contractor to Construction Manager, and that the Trade Contractor has researched as meeting specified project performance requirements; Construction Manager will present proposed substitutions for review by Consultant.

1.3.5.2 Solicited Substitutions: Consultant makes specific solicitation for substitutions that will be considered during the Bidding Period within the technical specifications:

1.3.5.2.1 These solicitations relate to Basis-of-Design Materials only, unless specific indication of No Substitutions Accepted is noted within technical specifications.

1.3.5.2.2 Consultant will notify bidders of acceptable substitutions as an additional Acceptable Material listing if found acceptable through a subsequent Addendum.

1.3.5.3 Apparent Substitutions: Substitutions found in the Work that have not been formally accepted by the Consultant in accordance with the requirements of this Section; unsolicited substitutions found in the work may result in a request to remove the affected work and replaced with the specified materials, or accepted with a suitable credit to the Contract where substitution is found suitable for the affected work as described later in this Section.
2 Products

2.1 SUBSTITUTIONS

2.1.1 Submit proposals for substitution as follows:

2.1.1.1 After Award of Contract: Prepare a submission using the Consultant’s standard form attached to the end of this Section; complete form in accordance with requirements of this Section and submit to the Consultant; Construction Manager will assemble requests for Substitutions requested by Trade Contractors and submit to the Consultant for review and as follows:

2.1.1.1.1 Consultant will attempt to review the substitute products submitted to determine acceptability within ten (10) days after receipt of Proposed Substitutions; but this is not a guaranty for delivery where additional submittals are made or where complexity of submittal requires additional time.

2.1.1.2 Requests for substitutions must follow procedures indicated in this Section:

2.1.1.2.1 Requests for substitutions that occur as a part of an RFI will not be answered, and will be returned to Trade Contractor for resubmission as a Request for Substitution.

2.1.1.2.2 Requests for substitutions that occur as a part of a shop drawing submission will not be answered, and will be returned to Trade Contractor for resubmission as a Request for Substitution.

2.1.2 In making a Proposal for Substitution the Trade Contractor represents:

2.1.2.1 That it has personally investigated the proposal and (unless the proposal explicitly states otherwise) determined that it performs in a similar way or is superior to the product or method specified.

2.1.2.2 That the same guaranty will be provided as for the originally specified product or construction method, where manufacturer’s warranty is a specification requirement.

2.1.2.3 That aesthetic or performance requirements for the project have not been substantially altered, or that required redesign on the part of the Consultant.

2.1.2.4 That it will coordinate installation of the accepted substitute into the Work, making such changes in the Work as may be required to accommodate the change.

2.1.2.5 That it will bear costs and waives claims for additional compensation for costs that subsequently become apparent arising out of the substitution.

2.1.2.6 That the quotation is complete and includes related costs and adjustments to adjacent construction or layouts.

3 Execution

3.1 GROUNDS FOR ACCEPTANCE

3.1.1 No substitution will be considered until full implication of the change to Consultant’s design and redesign has been fully considered, and payment for any redesign or drawing changes required by the Consultant resulting from the substitution is appropriately accounted for an paid by the appropriate parties.
3.1.2 The Consultant is not obliged to accept any Proposed Substitution; Consultant reserves the right to dismiss any item with no further explanation or accept as follows:

3.1.2.1 Acceptance during Bid Period: Proposed Substitutions will be reviewed as indicated in Construction Manager’s Instructions to Bidders with the Construction Manager; acceptable substitutions will be listed in the form of an Addendum or as a Post Bid Addendum.

3.1.2.2 Acceptance after Award of Contract: Proposed Substitutions will be reviewed with the Construction Manager with respect to constructability, cost and schedule impact, and adherence to project requirements; acceptable substitutions will be administered in the form of a Change Order or Change Directive.

3.1.3 Consultant may consider acceptance of Proposed Substitutions where:

3.1.3.1 Products selected by Trade Contractor from the specified Acceptable Materials or Basis-of-Design Materials are not available.

3.1.3.2 Delivery date of products selected from those specified would unduly delay completion of Contract.

3.1.3.3 Different products or construction methods to those specified that are considered by the Trade Contractor as performing in a manner similar to, or superior to those specified.

3.1.3.4 Verification that the substitute products can be obtained, meet the performance and aesthetic standards required for the project, and meet requirements of the Building Code.

3.1.3.5 Different products or construction methods that will result in credit to Contract Price and maintain the specified performance.

3.1.3.6 Products or construction methods that add cost to the Contract Price may be considered where additional value or life cycle cost benefits can be demonstrated for the Owner.

3.1.3.7 Products meet or exceed LEED® requirements specified in Section 01 35 21.

3.1.4 Include with Proposed Substitutions:

3.1.4.1 Complete data substantiating compliance of the proposed substitute with contract requirements including coordination and identification of modifications of adjacent construction affected by the substitution.

3.1.4.2 Substitute Products: Provide the following:

3.1.4.2.1 Product identification, including manufacturer's name and address.

3.1.4.2.2 Manufacturer's literature, including product description, performance and test data, reference standards, and limitations.

3.1.4.2.3 Comparison of properties to specified products.

3.1.4.2.4 Respective costs of items originally specified and proposed substitutions indicating credit or extra to the Contract Price.

3.1.4.2.5 Samples where appearance is relevant to consideration of Proposed Substitution.

3.1.4.2.6 Names and addresses of similar projects where the product has been used.

3.1.4.2.7 Listing of material criteria that proposed substitutions can contribute to Project LEED® Certification.
3.1.4.3 Substitute Construction Methods: Provide the following:

3.1.4.3.1 Detailed description of the proposed method, and drawings illustrating methods of construction.
3.1.4.3.2 Itemized comparison of proposed substitution with product or method specified.
3.1.4.3.3 Data relating to changes in schedule.
3.1.4.3.4 Detailed description of modifications required by proposed substitution to adjacent materials and configurations (if any).
3.1.4.3.5 Listing of construction methods that proposed substitutions can contribute to Project LEED® Certification.

3.1.4.4 Quotation for change in contract sum, if substitution is approved, indicated as an addition or deletion from Contract Price.

3.1.4.5 Verification that product complies with the Building Code and Contract Documents.

3.1.5 Should Proposed Substitution be found acceptable by the Consultant, in part or in whole, the Trade Contractor shall:

3.1.5.1 Assume full responsibility and costs when substitution affects any other Work.
3.1.5.2 Prepare drawings incorporating and coordinating aspects of affected Work bearing the seal and signature of an architect or engineer registered in Province of the Work.

3.2 GROUNDS FOR DENIAL

3.2.1 Unsolicited Substitutions will not be permitted and will be required to be removed and replaced with specified materials:

3.2.1.1 Consultant will either select a substitute product or recommend that extraordinary delivery methods be utilized to deliver the specified product at no additional cost to the Owner in the case of the preceding.
3.2.1.2 Consultant may accept credit to the value of the contract on behalf of the Owner at the Consultant’s discretion where Trade Contractor can show exceptional circumstances indicating why specified materials were not available at time of installation, and that resulted in the Unsolicited Substitution.
3.2.1.3 Unsolicited Substitutions resulting from negligence in ordering specified materials in proper advance time considering place of origin of product, normal method of delivery and manufacturers ordering requirements will not be considered for credit or time adjustments.

3.2.2 Consultant reserves the right to disregard any requests for substitutions submitted that are not presented with the information required by this Section and as follows:

3.2.2.1 Substitutions will not be considered that are implicit in submitted shop drawings and samples rather than formally presented proposals as described above.
3.2.2.2 Substitutions will not be considered that require substantial changes in the Contract Documents.

3.3 SUBSTITUTION REQUEST FORM

3.3.1 Use the form on the following page to request substitutions during construction period.
Substitution Request Form during Construction

Date: ___________________________  Project No.: ___________________________

Project Name: ______________________  Contract Title: ___________________________

Constructor’s Request must be accompanied by supporting data. Coordinate substitution request with DIALOG’s acceptance requirements and limitations listed in Section 01 25 00 – Substitution Procedures and complete the following information:

Specification Section Number: __________  Specification Title: __________________________________________

- ☐ Product Data for Proposed Substitution: Consisting of manufacturers product information, listing of appropriate reference standards, and performance and testing results
- ☐ Sample: Accompany substitution request with samples or small scale mock-ups of Proposed Substitution where appropriate, and where sample can assist DIALOG with assessing material or assembly properties.

Itemized comparison between Proposed Substitution and Specified Products, attach additional sheets as required where space provided is not sufficient:

<table>
<thead>
<tr>
<th>Specified Products</th>
<th>Proposed Substitution</th>
</tr>
</thead>
<tbody>
<tr>
<td>Name of Product:</td>
<td></td>
</tr>
<tr>
<td>Catalogue Number:</td>
<td></td>
</tr>
<tr>
<td>Manufacturer:</td>
<td></td>
</tr>
<tr>
<td>Significant Matching Properties:</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Significant Variations:</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Reason for Substitution:</td>
<td></td>
</tr>
<tr>
<td>Effect on Other Parts of the Work:</td>
<td></td>
</tr>
</tbody>
</table>

| Effect on Contract: |                       |

**Unit Cost Comparison:**

- Original Product: $__________________ per __________
- Substitution: $__________________ per __________

**Proposed Change to Contract Price**

- Credit to Contract: $__________________
- Additional Cost to Contract: $__________________

**Proposed Change to Contract Time**

- Reduce Contract Time by: __________ days
- Increase Contract Time by: __________ days

Submission of Proposed Substitution is not a direction to proceed with affected work, and does not constitute a change to Contract Price or extension to Contract Time until authorized by Change Order.

END OF SECTION
1 General

1.1 SUMMARY

1.1.1 This Specification section includes administrative provisions intended to minimize the quantity of Requests for Information submitted, and defines the categories of requests and methods used convey information between the parties reading the Contract Documents after execution of the Agreement.

1.1.2 This Specification section does not apply to enquiries and requests for clarification arising during the Bid Period; RFI’s submitted during the Bid Period will be considered as enquiries as defined in Instructions to Bidders.

1.1.3 The Consultant’s electronic management system (Onware) will be used in conjunction with Construction Manager.

1.1.4 The Construction Manager’s electronic management system (Aconex) will be used in conjunction with Trade Contractors.

1.2 RELATED REQUIREMENTS

1.2.1 Construction Manager’s Instructions to Bidders: Consultant’s response to enquiries submitted during the Bid Period; enquiries are not considered RFI’s.

1.2.2 Section 00 63 00 – Construction Administration Forms: Examples of Consultant’s change processing and supplemental information forms used during administration of the Contract.

1.2.3 Section 01 25 00 – Substitution Procedures: Procedures for proposing, reviewing and processing requests for different products during the course of the Work than those specified.

1.2.4 Section 01 31 13 – Project Coordination: Coordination of components of the work that rely on other components for fit within confined spaces or complex arrangements arising from combining multiple work results.

1.2.5 Section 01 31 19 – Project Meetings: Scheduling of project start-up meeting to discuss Consultant’s requirements for RFI’s and processing of RFI’s as a component of regularly scheduled Progress Meetings.

1.2.6 Section 01 31 26 – Electronic Communications Protocol for BIM: Responses to documents issued electronically, and that do not form a part of Contract Documents.

1.2.7 Section 01 33 00 – Submittal Procedures: Submissions of shop drawings, product data and samples for review by Consultant.

1.2.8 Section 01 33 50 – Delegated Design Submittals: Requirements for design solutions assigned to Trade Contractor for completion of fabrication specific detailing.

1.2.9 Division 01 – General Commissioning Requirements: Requests for information during commissioning phase of the Work; limiting excessive RFI’s by scheduling commissioning meetings.
DEFINITIONS

1.3 Request for Information (RFI): A formal process used during the construction phase of the project to facilitate communication between the Construction Manager, Consultant and Owner with regards to requests for additional information about the content of the Contract Documents as follows:

1.3.1 RFI is a standard document provided by the Consultant and submitted by the Construction Manager requesting interpretation or clarification to the Drawings and Specifications.

1.3.2 Consultant’s response to an RFI has the same status as a Supplemental Instruction defined under the Contract.

1.3.3 A properly prepared RFI will be considered by the Consultant as containing the following:

1.3.3.1 Detailed written statements clearly stating the nature of the interpretation or clarification requested.

1.3.3.2 Identify Drawings by drawing number, drawing name and location on the drawing sheet.

1.3.3.3 Identify Specifications by section number, section title, and listing page and paragraph numbers.

1.3.3.4 Site dimensions or conditions that are different from those indicated within Contract Documents and that affect request for interpretation or clarification.

1.3.3.5 Construction Manager’s reviewed suggested solutions submitted by Trade Contractor where request impacts construction means, methods, techniques, sequences and procedures, or as required for coordinating the various parts of the Work.

1.3.4 Construction Manager will identify RFI’s for two specific categories of request as follows:

1.3.4.1 Requests for Interpretation: Request made in accordance with contractual obligations for Consultant’s third party obligations for providing interpretations of the Contract Documents listed in Article A-3 of the Agreement.

1.3.4.2 Requests for Clarification: Request concerning items not indicated on Drawings or contained in Specifications, and that is required to perform the Work.

1.3.5 Improper RFI’s: An RFI that contains ambiguous language, numerous errors, or that contains incomplete information that does not identify specific components of the Drawings or Specifications, or that is sent to a party other than the Consultant.

1.3.6 Unnecessary RFI’s: RFI’s will not be accepted that contain requests for information that is apparent within the Contract Documents or reasonably inferable; that is apparent from site observations; or contains information that entails change of contractual responsibility; change of design; that is vague or ambiguous; or that asks for a response to shop drawings and substitutions.
1.4 ADMINISTRATIVE REQUIREMENTS

1.4.1 Preconstruction Meetings: Conduct a preconstruction attended by the affected Trade Contractors at specifically identified meetings throughout the Work, with Construction Manager, Consultant and Owner in accordance with Section 01 31 19 to discuss the following:

1.4.1.1 Review Consultant’s RFI form and required content for timely response, limitations of content, categories of requests that will be considered as valid RFI’s.

1.4.1.2 Review Consultant’s submission requirements, name and email address of primary contact and mode of transmission (fax, email, FTP site).

1.4.1.3 Review Consultant’s process for receiving, handling and responding to RFI’s including the following:

   1.4.1.3.1 In-House (Consultant’s) prime contact for accepting and dispersing RFI’s, and out-source responsibility to Sub consultants and specialist consultants.

   1.4.1.3.2 Confirmation of reasonable response times necessary to process and complete RFI’s.

   1.4.1.3.3 Electronic project management software, submission processes and record keeping requirements.

1.4.1.4 Establish a baseline for reasonable quantities of RFI submissions based on project circumstances and complexities, and methods for discussing adjustments to timeframes for processing requests during peak requests.

1.4.1.5 Review methods to resolve complex issues arising from RFI process; discuss methods for prioritizing critical responses and establishing mutually acceptable response times where multiple RFI’s are issued.

1.4.2 Coordination: Coordinate requirements for timely response period based on number or complexity of RFI’s issued during the course of the Work:

1.4.2.1 Consultant will endeavor to respond within a minimum of 5 to 7 Working Days or other time frame agreed upon prior to issuing any RFI’s:

   1.4.2.1.1 Response times can be 3 Working Days or less for individual easily resolved RFI’s; complex requests may take 14 Working Days or longer.

   1.4.2.1.2 Consultant will request additional response time where multiple RFI’s are received within a short period of time.

1.4.2.2 RFI’s received after 2:00 PM will be considered as received on the following Working Day.

1.4.2.3 Consultant’s response may include a request for additional information from the Trade Contractor, which will result in a mutually agreed upon increase to the time required to respond to the RFI.

1.4.2.4 RFI must state a date and time where need for response is different than indicated by the Consultant, or where greater urgency is required by the Construction Manager or Trade Contractor.

1.4.2.5 Consultant’s stated response time or other time proposed by any Trade Contractor or the Construction Manager does not represent a guaranty that RFI’s will be addressed within the stated time period.
1.4.3 Record Keeping: Construction Manager is responsible for preparing and maintaining a log of RFI’s and providing a copy to the Consultant when requested indicating any unanswered, incomplete or outstanding RFI’s:

1.4.3.1 Use RFI Log during project meetings and identify an agenda point during regular site meetings to discuss status of pending and upcoming RFI’s.

1.4.3.2 Consultant will maintain a similar record of responses to RFI’s, indicating a log of actions or reasons for non-response based on definitions contained in this Specification section.

1.5 SUBMITTALS

1.5.1 Provide required information in accordance with Section 01 33 00.

1.5.2 Action Submittals: Provide the following submittals before starting any work affected by RFI’s as follows:

1.5.2.1 Request for Information: Submit using RFI form prepared by Consultant based on example document attached to this Specification section and as follows:

1.5.2.1.1 Indicate correct use of Interpretation or Clarification based on definitions listed above.

1.5.2.1.2 Complete all required entry items; handwritten entries must be fully legible after photocopying, scanning or facsimile transmission (fax).

1.5.2.1.3 Include one topic for each RFI, submitted in chronological order with no breaks in consecutive numbering.

1.5.2.1.4 Label each page of attachments with RFI number.

1.5.2.1.5 Submit completed RFI using accepted mode of transmission discussed at preconstruction meeting.

2 Products

2.1 NOT USED

3 Execution

3.1 EXAMINATION

3.1.1 Validity of Request: Consultant will accept requests when one or more of the following conditions have been met by the Construction Manager:

3.1.1.1 Pre-Submission Review: Review requests from Trade Contractors, manufacturers and suppliers before submitting any RFI to determine whether request is valid.

3.1.1.2 Need for Interpretation: Trade Contractor requires additional information arising from disconnects within Contract Documents, and where intent cannot be reasonably inferred from information presented in the Specifications and Drawings such as the following:

3.1.1.2.1 Interpretation will occur when inconsistencies arise from differing information components leading to contradictions between parts of the Contract Documents.
3.1.1.2 Interpretation will occur to address omissions, differences in coordination, or contradictions for placement of components indicated on Drawings and Specifications that lead to uncertainty of intent contained within the Contract Documents.

3.1.1.3 Need for Clarification: Trade Contractor is unable to determine material or system required for project from the Contract Documents, or where site conditions or circumstances are different from those indicated within the Contract Documents.

3.2 PREPARATION

3.2.1 Unanswered Bid Enquiries from Bid Period: Bid Enquiries during the bidding period are not considered RFI's and as such may not have been completely addressed through the addendum or bid revision process:

3.2.1.1 Consultant informs Trade Contractors that complexity of a Bid Enquiry or timeliness of a submission may delay or cause an incomplete response requiring additional interpretation or clarification during course of the Work.

3.2.1.2 It is expected that any outstanding or incomplete enquires arising from the Bid period will be submitted in the form of an RFI immediately upon award of Contract so that suitable responses can be provided by the Consultant.

3.3 CONSTRUCTION MANAGER’S RESPONSIBILITIES

3.3.1 Alternative to RFI’s: Determine urgency of Request for Information; and wherever possible, include request for interpretation or clarification as a component of the next regularly scheduled Project Meeting:

3.3.1.1 Consultant will endeavour to provide a response as a component of the meeting minutes.

3.3.1.2 Consultant will accept that a special Project Meeting may be required to discuss coordination of complex or numerous RFI points within a regularly scheduled Project Meeting.

3.3.1.3 Submit an RFI where item cannot be addressed during meeting, or where urgency of need or complexity of item cannot be adequately addressed during Project Meeting.

3.3.2 Completion of Standard RFI Form: Prepare Consultant’s standard RFI form by completely filling in all required fields and clearly stating the nature of the request:

3.3.2.1 Attach additional or covering information necessary to provide clarity to request and submitting in a timely manner, or that does not fit on the standard form provided by the Consultant.

3.3.2.2 Accompany RFI’s issued for coordination issues of items like pipe and duct routing, or clearances for other work shown diagrammatically requiring specific locations by including drawings or sketches drawn to scale indicating suggested solutions.
3.3.3 Acceptance of RFI’s: RFI’s will only be accepted from Trade Contractors as follows:

3.3.3.1 All Trade Contractor RFI’s must be sent to Construction Manager; RFI’s sent directly to Consultant by Trade Contractor without Construction Manager’s prior review will not be accepted and will be returned unanswered.

3.3.3.2 RFI’s sent directly to Subconsultants by the Trade Contractors or Construction Manager will not be accepted and will be returned unanswered; unless agreed to before submission of RFI.

3.3.3.3 Include requests from Trade Contractors, manufacturers and suppliers as a part of Construction Manager submission.

3.3.3.4 RFI’s received by Consultant that are sent directly from any Trade Contractor, manufacturer and supplier; and that are not a part of the Construction Manager’s RFI, will be returned unanswered.

3.3.4 Contract Changes Resulting from RFI Responses: Consultant will respond to properly prepared RFI’s with the assumption that no change to Contract Price or Contract Time is involved with RFI’s:

3.3.4.1 Notify Consultant immediately about any concerns arising from Consultant’s response that has potential to affect Contract Price or Contract Time.

3.3.4.2 Do not prepare RFI’s with the anticipation that responses will automatically justify increased Contract Price or extensions to Contract Time.

3.3.4.3 Do not proceed with any work associated with the affected RFI until a Change Order is prepared and approved, or a Change Directive is issued where urgency for continuation of the Work dictates.

3.4 CONSULTANT’S RESPONSE

3.4.1 Consultant will respond to properly prepared RFI’s by one of the following methods:

3.4.1.1 Directly on the submitted form or using additional attachments as appropriate to address concerns identified where no change to the Contract is anticipated.

3.4.1.2 Retaining original RFI and issuing a Proposed Change Notice where Construction Manager indicates that a change to Contract is required.

3.4.1.3 Completion of response will close the RFI.

3.4.2 Consultant will identify Improper RFI’s to Construction Manager before responding, and will attempt to respond where content does not relate to means and methods for delivery of the Work:

3.4.2.1 Improper RFI’s that cannot be reasonably interpreted by the Consultant will be treated the same as Unnecessary RFI’s.

3.4.2.2 Return of Improper RFI will close the RFI.

3.4.3 Consultant will identify and return Unnecessary RFI’s directly to Construction Manager unanswered with a notation Not Reviewed accompanied by wording stating specific reasons and follow-up action where required:

3.4.3.1 Return of Unnecessary RFI will close the RFI.
3.4.4 Construction Manager or Trade Contractor can disagree with Consultant's response to a properly prepared RFI, or any assessment of RFI's considered by the Consultant as Improper or Unnecessary at any time during the communication process; disagreement will result in closing the current RFI and initiation of a meeting to discuss further resolution.

END OF SECTION
1 General

1.1 INTENT

1.1.1 Read this Section in conjunction with conditions governing changes in Work and valuation of changes in General Conditions of Contract. This section shall be viewed as complementary to General Conditions of Contract.

1.1.2 General Conditions of Agreement between Owner and Construction Manager provide for valuation of changes by three different methods: lump sum, unit price, and cost plus. This Section applies to lump sum method only.

1.2 DEFINITIONS

1.2.1 Actual Cost of Material and Labour: As used in valuation of changes article in General Conditions of Contract, means sum of costs directly related to or necessarily and properly incurred by Construction Manager, Trade Contractors and Sub-Trade Contractors in performance of a change in Work. Direct costs shall include:

1.2.1.1 Materials cost,
1.2.1.2 Total labour cost,
1.2.1.3 Travel and subsistence cost,
1.2.1.4 Temporary work cost,
1.2.1.5 Construction equipment cost,
1.2.1.6 and shall exclude overhead cost and profit.

1.2.2 Material Cost: Means cost of Materials, including transportation and storage thereof. Rebates, refunds, returns from sale of surplus Materials, and trade discounts other than prompt payment discounts, shall be credited to Owner.

1.2.3 Total Labour Cost: Means sum of direct labour cost and payroll burden cost, excluding fee and overhead arising from changes to work.

1.2.4 Direct Labour Cost: Means base wage costs of employees, excluding payroll burden cost.

1.2.5 Payroll Burden Cost: Means costs statutory charges and fringe benefit costs additional to direct labour cost and includes unemployment insurance, workers’ compensation, vacation pay, statutory holiday pay, health and welfare, pension plan, training fund, and other payroll costs which are hourly wage dependent and are paid by employer.

1.2.6 Travel and Subsistence Cost: Means travel and subsistence costs incurred by employees when working beyond a reasonable commuting distance from their normal place of residence.

1.2.7 Temporary Work Cost: Means cost of temporary structures, facilities, services, controls, and other temporary items used in performance of a Change in Work, including maintenance, dismantling and removal, less any residual value after dismantling and removal.

1.2.8 Construction Equipment Cost: Means cost of rented or owned equipment, including cost of loading, transportation, unloading, erection, maintenance, dismantling and removal.
1.2.9 **Overhead Cost:** means Construction Manager's, Trade Contractors' and Sub-Trade Contractors' costs related to:

1.2.9.1 Operation and maintenance of head offices, branch offices, and site offices,
1.2.9.2 Administration at head offices, branch offices, and site offices,
1.2.9.3 General management, legal, audit, and accounting services,
1.2.9.4 Buying organization, corporate tax,
1.2.9.5 Financing and other bank charges,
1.2.9.6 Bonding and insurance,
1.2.9.7 Salaries and other compensation of off-site personnel,
1.2.9.8 Salaries and other compensation of on-site superintendents and other supervisory personnel,
1.2.9.9 Planning, estimating, and scheduling of work,
1.2.9.10 Expendable and non-expendable small tools, including maintenance thereof,
1.2.9.11 Recruitment and training of on-site staff, and
1.2.9.12 All other costs not defined as direct costs.

1.3 **FORCE LABOUR AND EQUIPMENT RATES**

1.3.1 Submit to Construction Manager with Bid Form, Procurement Form Submittals Force Labour and Equipment Rates for approval. Trade Contractors failing to submit list of Force Labour and Equipment Rates will be excluded from Contract Award Process.

1.3.2 Rates stated shall be hourly labour rates that will be applied when estimating increases and decreases in cost resulting from changes in Work. Assume that work will be performed during regular working hours, not premium time.

1.3.3 Construction Manager will use approved schedule solely for evaluating Trade Contractor Proposals for changes in Work. Nothing specified herein, nor submission of Labour and Equipment Rates by Trade Contractor, shall be construed to mean that Construction Manager has established, or will establish, minimum wages or benefits applicable to Work, other than those required by law.

1.3.4 Include trades that will be employed in Work, including Trade Contractors and Sub-Trade Contractors.

1.3.5 Provide a breakdown indicating total hourly labour rates for journeymen, apprentices, foremen, and other applicable classifications within each trade.

1.3.6 Labour rates stated shall be consistent with rates that will actually be paid in normal performance of Work, during regular working hours, and shall not exceed the following:

1.3.6.1 Where collective agreements apply:
   1.3.6.1.1 Rates for direct labour cost shall not exceed rates established by collective agreements, and
   1.3.6.1.2 Rates for payroll burden cost shall not exceed rates established by collective agreements and statutory charges.

1.3.6.2 Where collective agreements do not apply rates for direct labour cost shall not exceed rates prevailing in locality of Project.

1.3.7 Construction Manager’s approval of rates provided will be conditional upon compliance with the most current information available to Construction Manager on Province of Work construction industry wages and benefits.
1.3.8 Trade Contractor may request an amendment to an approved rate stated, if and when required on account of a change in rate that will actually be paid in normal performance of Work. If Trade Contractor can prove to Construction Manager’s satisfaction that a different rate will actually be paid, Construction Manager will make application to Owner for an adjustment. Owner may, at his sole discretion, approve or disapprove such a change in rate.

1.4 PROPOSED CHANGE ORDER

1.4.1 Consultant will issue Proposed Change order to the Construction Manager who will issue a detailed description of proposed changes in the Work that may require adjustment to the Contract Price or the Contract Time, which will include a request for any supplemental or revised Drawings and Specifications that need to be prepared by the Consultant.

1.4.2 Proposed Change Orders issued by the Consultant or Construction Manager are for information only, and as such shall not be considered as instructions either to stop work in progress or to execute the proposed change.

1.5 MINOR CHANGES IN THE WORK

1.5.1 Consultant will issue through Construction Manager supplemental instructions authorizing Minor Changes in the Work, not involving adjustment to the Contract Price or the Contract Time, using the Consultant’s standard form of Construction Communication.

1.6 WORK ORDERS

1.6.1 Owner, through Consultant will issue a Work Order where Owner requires Construction Manager to proceed with a change in Work prior to Owner and Construction Manager agreeing upon an adjustment in Contract Price and Contract Time.

1.6.2 Upon receipt of a Work Order, Construction Manager will instruct Trade Contractor to proceed promptly with change in Work. Adjustment in Contract Price for a change carried out by way of a Work Order shall be determined on the basis of actual cost of expenditures or savings to perform Work attributable to change. If a change in Work results in a net increase in Contract Price, an allowance for overhead and profit shall be included.

1.6.3 If a change in Work results in a net decrease in Contract Price, amount of credit shall be net cost, without deduction for overhead and profit. When both additions and deletions covering related work or substitutions are involved in a change in Work, allowance for overhead and profit shall be calculated on the basis of net increase, if any, with respect to that change in Work.

1.6.4 Trade Contractor shall keep and present, in such form as Construction Manager may require, an itemized accounting of the cost of expenditures and savings together with supporting data. Cost of performing work attributable to Work Order shall be limited to actual cost of all of the following:

1.6.4.1 Wages and benefits paid for labour in direct employ of Trade Contractor under applicable collective bargaining agreements, or under Force Labour Rate Schedule agreed upon by Owner, Construction Manager, and Trade Contractor,

1.6.4.2 Salaries wages and benefits of Trade Contractor’s office engaged in a technical capacity and other personnel at shops or in the road, engaged in expediting the production or transportation of materials or equipment,
1.6.4.3 Contributions, assessments, or taxes incurred for such items as unemployment insurance, provincial health insurance, workers’ compensation, and Canada Pension Plan, insofar as such cost is based on wages, salaries, or other remuneration paid to employees of Trade Contractor and included in cost of work,

1.6.4.4 Travel and subsistence expenses of Trade Contractor’s personnel as described above,

1.6.4.5 Cost of Products including cost of transportation,

1.6.4.6 Costs of materials, supplies, equipment, temporary services and facilities, and hand tools not owned by workers, including transportation and maintenance, which are consumed; and cost less salvage value on such items used but not consumed, which remain property of Trade Contractor,

1.6.4.7 Rental costs of tools, machinery, and equipment, exclusive of hand tools, whether rented from or provided by Trade Contractor or others, including installation, minor repairs and replacements, dismantling, removal, transportation, and delivery costs,

1.6.4.8 Deposits lost,

1.6.4.9 Amounts of subcontracts,

1.6.4.10 Cost of quality assurance such as independent inspection and testing services, if required,

1.6.4.11 Royalties, patent license fees, and damages from infringement of patents and cost of defending suits,

1.6.4.12 Charges levied by authorities having jurisdiction,

1.6.4.13 Any adjustment in premiums for bonds and insurance that Trade Contractor is required to purchase and maintain under terms of Subcontract Agreement,

1.6.4.14 Any adjustments in taxes and duties for which Trade Contractor is liable,

1.6.4.15 Charges for long distance telephone and facsimile communications, courier services, expressage, and petty cash items incurred,

1.6.4.16 Cost of removal and disposal of waste products and debris,

1.6.4.17 Cost incurred due to emergencies affecting safety of persons or property.

1.6.5 Pending determination of the final amount of a Work Order, the undisputed value of work performed as a result of a Work Order is eligible to be included in progress payments to Trade Contractor.

1.6.6 If Owner and Construction Manager do not agree on proposed Trade Contractor adjustment in Contract Time or method of determining it, the adjustment shall be referred to Consultant for determination.

1.6.7 If at any time after start of work directed by a Work Order, Owner, Construction Manager, and Trade Contractor reach an agreement on an adjustment to Contract Price and Contract Time, this agreement shall be recorded in a Change Order signed by Owner, Construction Manager and Trade Contractor.

1.7 WORK ORDER PROCESS TIME

1.7.1 Allow seven (7) working days for processing of Work Order after request by Construction Manager for proposed change. Construction Manager will make a formal request to Consultant for a change to Work. Consultant will then prepare Work Order, process time will be as follows:

1.7.1.1 Construction Manager request for Work Order: 1 day

1.7.1.2 Consultant preparation of Work Order: 3 days

1.7.1.3 Issued to Owner for review, approval and distribution: 1 day
1.7.1.4 Construction Manager review of Work Order and Issue to Trade Contractors: 1 day
1.7.1.5 Courier and transportation of documents between reviewers: 1 day

1.7.2 Trade Contractor shall proceed immediately with work required by Work Order upon receipt of Work Order from Construction Manager.

1.7.3 Construction costs and overheads shall be determined as noted above. Remainder of process shall follow procedures outlined in Changes to Work, Proposed Change Notice detailed below.

1.8 CHANGES IN WORK - LUMP SUM METHOD OF VALUATION

1.8.1 Construction Manager will issue a Proposed Change Notice (PCN) to Trade Contractor.

1.8.2 Trade Contractor shall submit a request to Construction Manager stipulating:

1.8.2.1 A lump sum increase, decrease, or no change in Contract Price, and
1.8.2.2 An increase, decrease, or no change in Contract Time,
1.8.2.3 On account of proposed change in Work.

1.8.3 Include in Trade Contractor Proposal a detailed breakdown of lump sum increase or decrease, indicating Trade Contractor’s, and where applicable Trade Contractors’ and Sub-Trade Contractors’:

1.8.3.1 Itemized direct costs applicable to proposed change in Work, and
1.8.3.2 Applicable amounts for overhead and profit, in accordance with percentages specified in General Conditions of Contract.
1.8.3.3 Do not include costs that would otherwise be incurred in normal performance of Work.

1.8.4 Include a detailed breakdown of Trade Contractor Proposal a further breakdown of total labour and equipment cost component indicating, for each applicable trade and trade classification, labour and equipment rate(s) and number of hours from which total labour or equipment cost is derived.

1.8.5 Include a detailed breakdown of Trade Contractor Proposal only those Labour and Equipment Rates included in Schedule of Labour and Equipment Rates and previously approved by Construction Manager in writing, unless extra work cannot be performed during regular working hours and Construction Manager has given approval, in writing, for premium time labour rates.

1.8.6 The following maximum fees may be charged for work other than those covered by unit prices (which include overhead and profit):

1.8.6.1 Work carried out by Trade Contractor: 5% overhead and profit combined for work up to and including $10,000 value and a negotiated amount for amounts exceeding a value of $10,000.
1.8.6.2 Credits to Owner’s account: Trade Contractors’ overhead and profit shall not be deducted.

1.8.7 Upon Owner’s approval and acceptance of Trade Contractor Proposal, a “Change Order” will be issued to Trade Contractor.
1.9 CHANGE ORDER PROCESS TIME

1.9.1 Allow twenty five (25) working days for processing of change order after request to Construction Manager for proposed change. Construction Manager will make a formal request to Consultant for a change to Work. Consultant will then prepare Proposed Change, process time will be as follows:

1.9.1.1 Construction Manager request for Proposed Change Notice: 1 day
1.9.1.2 Consultant preparation of Proposed Change Notice: 5 days
1.9.1.3 Issued to Owner for review, approval and distribution: 3 days
1.9.1.4 Construction Manager review of Proposed Change Notice prepared by Owner: 1 day
1.9.1.5 Trade Contractor preparation of required information: 7 days
1.9.1.6 Construction Manager preparation of Proposed Change Notice pricing documentation: 1 day
1.9.1.7 Consultant review of Proposed Change Notice pricing documentation and preparation of Change Order: 5 days
1.9.1.8 Owners review and acceptance of Change Order: 2 days
1.9.1.9 Courier and transportation of documents between reviewers: 2 days

1.10 ALLOWANCES

1.10.1 A Change Order will be used to adjust allowance amounts indicated in Section 01 21 00 - Allowances; base each Proposed Change Order on the difference between purchase amount and the allowance, multiplied by final measurement of work-in-place; include reasonable allowances for cutting losses, tolerances, mixing wastes, normal product imperfections, and similar margins, if applicable, and as follows:

1.10.1.1 Include installation costs in purchase amount only where indicated as part of the allowance.
1.10.1.2 Prepare explanation and documentation to substantiate distribution of overhead costs and other margins claimed, if requested.

1.10.2 Submit claims for increased costs arising from change in scope or nature of the allowance described in the Contract Documents, whether for the Purchase Order amount or Contractor's handling, labor, installation, overhead, and profit.

1.10.3 Submit claims within 21 days of receipt of the Change Order authorizing work to proceed; Owner will reject claims submitted later than number of days stated for such authorization:

1.10.3.1 Do not include Trade Contractor's indirect expense in the Change Order cost amount unless it is clearly shown that the nature or extent of work has changed from what could have been foreseen from information in the Contract Documents.
1.10.3.2 No change to Contractor's indirect expense is permitted for selection of higher or lower priced materials or systems of the same scope and nature as originally indicated.

2 Products

2.1 NOT USED

3 Execution

3.1 NOT USED

END OF SECTION
1 General

1.1 SUMMARY

1.1.1 This Section includes administrative provisions for coordinating construction operations on Project including, but not limited to, the following:

1.1.1.1 General project coordination procedures
1.1.1.2 Coordination of Drawings and Specifications
1.1.1.3 Coordination of LEED® requirements
1.1.1.4 Administrative and supervisory personnel
1.1.1.5 Electronic project management software systems

1.1.2 Each Trade Contractor shall participate in coordination requirements. Certain areas of responsibility will be assigned to specific Trade Contractors by Construction Manager.

1.2 RELATED REQUIREMENTS

1.2.1 Section 01 26 13 – Requests for Interpretation Procedures
1.2.2 Section 01 31 19 – Project Meetings
1.2.3 Section 01 32 00 – Schedules: Construction progress documentation for preparing and submitting Construction Manager's Construction Schedule.
1.2.4 Section 01 33 00 – Submittal Procedures
1.2.5 Section 01 45 26.23 – Site Quality Control Procedures - Durable Building Quality Management Program: Coordinating requirements for constructability to achieve LEED® durable building credit.
1.2.6 Section 01 73 00 – Execution: Coordinating general installation and site engineering services, including establishment of benchmarks and control points.
1.2.7 Section 01 77 00 – Closeout Procedures
1.2.8 Division 01 – General Commissioning Requirements
1.2.9 Divisions 21, 22 and 23 – Common Work Results: Common work results for fire suppression, plumbing, and heating, ventilating and air conditioning systems
1.2.10 Division 25 – Common Work Results: Common work results for integrated automation.
1.2.11 Divisions 26, 27 and 28 – Common Work Results: Common work results for electrical, communications, and electronic safety and security.

1.3 ADMINISTRATIVE REQUIREMENTS

1.3.1 General Coordination: Coordination that generally applies to all components of the Project Manual as follows:

1.3.1.1 Review requirements for inclusion of schedule milestones to ensure timely submittal of shop drawings, product data and samples for review by Consultant, and expected time frame for review accounting for possible resubmission without delay consequences.
1.3.1.2 Trade Contractor shall coordinate construction activities as required with Construction Manager’s Schedule to ensure efficient and orderly installation of each part of Work.

1.3.1.3 Either before or after its own installation, notify Construction Manager where Trade Contractor’s installation of one part of Work is dependent on installation of other components.

1.3.1.4 Construction Manager will schedule and coordinate construction activities of other Trade Contractors in sequence required to obtain best results. Where availability of space is limited, Trade Contractor shall coordinate installation of different components to assure maximum accessibility for required maintenance, service, and repair.

1.3.1.5 Trade Contractor shall make adequate provisions to accommodate items scheduled for later installation by other Trade Contractors, under separate contract or by Construction Manager’s own forces.

1.4 SUBMITTALS

1.4.1 Provide submittals in accordance with Section 01 33 00.

1.4.2 Coordination Drawings: Prepare Coordination Drawings where limited space availability necessitates maximum utilization of space for efficient installation of different components or where coordination is required for installation of products and materials fabricated by separate entities:

1.4.2.1 Indicate relationship of components shown on separate Shop Drawings.

1.4.2.2 Indicate required installation sequences.

1.4.2.3 Refer to Divisions 21, 22, and 23 – Mechanically related sections, and Division 25, 27, 28 and 29 Electrically related sections for specific coordination Drawing requirements for mechanical and electrical installations.

1.4.3 Staff Names: Within 15 days of starting construction operations, submit a list of principal staff assignments, including superintendent and other personnel in attendance at Project site:

1.4.3.1 Identify individuals and their duties and responsibilities.

1.4.3.2 List addresses and telephone numbers; including office and alternate telephone numbers.

1.4.3.3 Provide names, addresses, and telephone numbers of individuals assigned as standbys in absence of individuals assigned to Project.

1.4.3.4 Post copies of list in Project meeting room, in temporary site office, and by each temporary telephone.

2 Products

2.1 ELECTRONIC PROJECT MANAGEMENT SOFTWARE SYSTEMS

2.1.1 Consultant will use Onware project management software to track and manage Project to manage requests for interpretation, construction communications, change directives and change orders for the Project; the Consultant’s version of software will be considered as the official record for project.

2.1.2 Construction Manager may use their own electronic management software (Aconex) for managing their in-house operations, but will be required to use Onware, Consultant’s version for submission of Requests for Information (RFI’s), Progress Claims and other administration documentation.
2.1.3 Construction Manager will coordinate mutually agreeable project timelines for requests for interpretation, shop drawing reviews and progress claims for inclusion into Consultants electronic project management software system.

2.2 ON-SITE DOCUMENTS

2.2.1 Maintain at job site, one copy each of the following:

2.2.1.1 Contract drawings
2.2.1.2 Specifications
2.2.1.3 Addenda
2.2.1.4 Reviewed shop drawings
2.2.1.5 Change orders
2.2.1.6 Other modifications to Contract
2.2.1.7 Site test reports
2.2.1.8 Copy of approved Work schedule
2.2.1.9 Copy of LEED® Reference Package, including latest modifications
2.2.1.10 Manufacturers’ installation and application instructions
2.2.1.11 Labour conditions and wage schedules
2.2.1.12 Applicable current editions of municipal regulations and by-laws
2.2.1.13 Current building codes, complete with addenda bulletins applicable to Place of Work

3 Execution

3.1 ADMINISTRATIVE PROCEDURES

3.1.1 Trade Contractor shall coordinate with Construction Manager scheduling and timing of required administrative procedures with other construction activities to avoid conflicts and ensure orderly progress of Work. Such administrative activities shall include, but not be limited to, the following:

3.1.1.1 Preparation of schedules and coordination with Construction Manager’s and other Trade Contractor’s activities.
3.1.1.2 Installation and removal of temporary facilities under direction of Construction Manager not provided by Construction Manager.
3.1.1.3 Delivery and processing of submittals for Construction Manager conveyance to Consultant and Owner.
3.1.1.4 Progress meetings where required by Construction Manager and Owner.
3.1.1.5 Contract acceptance procedures as scheduled by Construction Manager and as necessary to fulfill Owners acceptance procedures.

3.2 COORDINATION

3.2.1 Construction Manager will coordinate construction operations included in various Sections of Specifications to verify efficient and orderly installation of each part of Work.

3.2.2 Construction Manager will coordinate construction operations, included in different Sections that depend on each other for proper installation, connection, and operation with Trade Contractors as follows:

3.2.2.1 Scheduling construction operations in sequence required to obtain best results where installation of one part of Work depends on installation of other components, before or after its own installation.
3.2.2 Coordinating installation of different components with Trade Contractors to verify maximum accessibility for required maintenance, service, and repair.

3.2.2.3 Making adequate provisions to accommodate items scheduled for later installation.

3.2.3 Construction Manager will prepare memoranda where necessary, for distribution to each party involved, outlining special procedures required for coordination. Include such items as required notices, reports, and list of attendees at meetings:

3.2.3.1 Prepare similar memoranda for Owner where coordination of Owner installed Work is required.

3.2.4 Trade Contractor shall coordinate scheduling and timing of required administrative procedures with other construction activities, and activities of other contractors if any, to avoid conflicts and to verify orderly progress of Work. Administrative activities include, but are not limited to, the following:

3.2.4.1 Preparation of Construction Manager's Construction Schedule
3.2.4.2 Preparation of Schedule of Values
3.2.4.3 Installation and removal of temporary facilities and controls
3.2.4.4 Delivery and processing of submittals
3.2.4.5 Delivery and processing of LEED® Material Information Sheets
3.2.4.6 Progress meetings
3.2.4.7 Preinstallation conferences
3.2.4.8 Project closeout activities

3.3 GENERAL INSTALLATION PROVISIONS

3.3.1 Construction Manager requires installer of each major component to inspect both substrate and conditions under which Work is to be performed. Do not proceed until unsatisfactory conditions have been corrected in an acceptable manner.

3.3.2 Trade Contractor shall comply with manufacturer's installation instructions and recommendations, to extent that those instructions and recommendations are more explicit or stringent than requirements contained in Contract Documents and Specifications.

3.3.3 Trade Contractor shall inspect Materials immediately upon delivery and again prior to installation. Reject damaged and defective items and arrange for replacement.

3.3.4 Trade Contractor shall provide attachment and connection devices and methods necessary for securing Work. Secure Work true to line and level. Allow for expansion and building movement.

3.3.5 Construction Manager will supervise Work, Trade Contractor shall:

3.3.5.1 Provide uniform joint widths in exposed Work. Arrange joints in exposed Work to obtain the best visual effect. Refer questionable choices to Construction Manager for final decision.
3.3.5.2 Install each component during weather conditions and Project status that will ensure best possible results. Isolate each part of completed construction from incompatible material as necessary to prevent deterioration.
3.3.5.3 Coordinate temporary enclosures with required inspections and tests, to minimize necessity of uncovering completed construction for that purpose.
3.3.5.4 Install individual components at standard mounting heights recognized
within the industry for particular applications indicated where mounting
heights are not indicated. Refer questionable mounting height
decisions to Construction Manager for final decision.

3.3.5.5 Coordinate construction activities to ensure that no part of Work;
completed or in progress, is subject to harmful, dangerous, damaging,
or otherwise deleterious exposure during construction period.

END OF SECTION
1 General

1.1 PROJECT START-UP MEETING

1.1.1 Schedule a project start-up meeting after date of commencement of the Contract and prior to commencement of activities at the Place of the Work.

1.1.2 Purpose: to review personnel assignments, responsibilities, and administrative and procedural requirements, including site safety plans.

1.1.3 Location: Construction Manager’s, Owners, or Consultant’s Offices, as later agreed upon.

1.1.4 Minutes: Construction Manager will record minutes, will chair the meeting and distribute minutes to parties of record prior to the next scheduled meeting.

1.1.5 Attendees:

1.1.5.1 Construction Manager’s Representatives: Construction Manager’s senior management, project manager, site superintendent, representatives of major Trade Contractors, and others as necessary.

1.1.5.2 Consultant’s Representatives: as determined by Consultant.

1.1.5.3 Owner’s Representatives: as determined by Owner.

1.1.6 Agenda:

1.1.6.1 Introduction of Owner’s, Consultant's and Construction Manager’s representatives.

1.1.6.2 Review of significant contractual responsibilities and administrative and procedural requirements.

1.1.6.3 Incorporate mutually agreed variations to Contract Documents into Agreement, prior to signing.

1.1.6.4 Review of Construction Manager’s site safety requirements.

1.1.6.5 Review of Construction Manager’s site orientation requirements.

1.1.6.6 Review of Trade Contractor Proposed Substitutions, as required by Section 01 62 00.

1.1.6.7 Scheduling and coordination of Work, including the following:

1.1.6.7.1 Safe entry and egress to be maintained

1.1.6.7.2 Establishing emergency procedures

1.1.6.7.3 Verification of closures required

1.1.6.7.4 Verification of requirements for fire safety and construction safety to be maintained

1.1.6.7.5 Noise and dust control, with regard to normal building operations

1.1.6.7.6 Verification of site access, storage areas and parking relative to Construction Manager’s forces

1.1.6.7.7 Scheduling of critical shutdowns and changeovers

1.1.6.8 Appointment of official representative of participants in Work

1.1.6.9 Schedule of submission of shop drawings, samples, and colour chips in accordance with Section 01 33 00 - Submittal Procedures.

1.1.6.10 Requirements for temporary facilities, site sign, offices, storage sheds, utilities, and fences in accordance with Section 01 50 00 – Temporary Facilities.

1.1.6.11 Delivery schedule of specified equipment.

1.1.6.12 Proposed changes, change orders, procedures, approvals required, mark-up percentages permitted, time extensions, overtime, and administrative requirements.
1.1.6.13 Owner Supplied Products.
1.1.6.14 Submission of LEED Documents in accordance with Section 01 35 31 – LEED Special Project Procedures
1.1.6.15 Submission of Record Documents in accordance with Section 01 78 39 – Project Record Documents
1.1.6.16 Take-over procedures, acceptance, and warranties in accordance with Section 01 77 00 – Closeout Procedures
1.1.6.17 Monthly progress claims, administrative procedures, photographs, and holdbacks
1.1.6.18 Appointment of inspection and testing agencies or firms in accordance with Section 01 45 00 – Quality Control
1.1.6.19 Insurances and transcript of policies

1.2 LEED COORDINATION MEETING

1.2.1 Schedule a series of meetings attended by Construction Manager, Trade Contractors and suppliers at key milestones, and occurring prior to construction closeout activities; meetings can be concurrent with regular progress meetings.

1.2.2 Purpose: To review progress against LEED submittals and onsite activities performed during work on site.

1.2.3 Location: Same location as Construction Progress Meetings listed later in this Section.

1.2.4 Attendees:

1.2.4.1 Construction Manager’s Representatives: Construction Manager’s LEED Champion, project manager and site superintendent, and representatives of Trade Contractors affected by LEED project requirements, and others as necessary

1.2.4.2 Consultant’s Representatives: as determined by Consultant including; but not limited to, LEED Coordinator

1.2.4.3 Owner’s Representatives: as determined by Owner

1.2.5 Minutes: Consultant will chair meeting and record actionable items in minutes for Construction Progress Meetings

1.2.6 Agenda:

1.2.6.1 Review of LEED Checklist requirements and submissions received to date

1.2.6.2 Review of Owner’s anticipated credits based on current submissions

1.2.6.3 Other business

1.3 CONSTRUCTION PROGRESS MEETINGS

1.3.1 Schedule regular construction progress meetings during the course of the Work.

1.3.2 Purpose: to monitor construction progress, site safety performance, and to identify problems and action required for their solution, to expedite the Work.

1.3.3 Frequency: every two weeks or as otherwise directed by Consultant or Construction Manager.

1.3.4 Location: Construction Manager’s site office.
1.3.5 Attendees:

1.3.5.1 Construction Manager's Representatives: Construction Manager's project manager and site superintendent, and Sub Contractors, suppliers and other parties involved in the Work when requested. Construction Manager's and Sub Contractor's representatives shall be qualified and authorized to act on behalf of the party each represents.

1.3.5.2 Consultant's Representatives: as determined by Consultant.

1.3.5.3 Owner's Representatives: as determined by Owner.

1.3.6 Agenda:

1.3.6.1 Review and approval of minutes of previous meeting.

1.3.6.2 Review of items of significance that could affect progress.

1.3.6.3 Other topics for discussion as appropriate to current status of the Work.

1.3.7 Minutes: Construction Manager will record minutes and distribute copies to all attendees within seven days after meeting.

1.4 WARRANTY MEETINGS

1.4.1 Warranty meetings shall be held between Substantial Performance of the Work and the completion of the Warranty period.

1.4.2 Purpose: to bring to Construction Manager's attention Contract Deficiencies identified during warranty period, determine action required for their correction, and monitor progress of Contract Deficiency correction.

1.4.3 Frequency: called by Owner on an as-needed basis.

1.4.4 Location: as agreed to between Owner and Construction Manager.

1.4.5 Minutes: Construction Manager will record minutes, will chair the meeting and distribute minutes to parties of record prior to the next scheduled meeting.

1.4.6 Attendees: same as construction progress meetings.

1.4.7 Agenda:

1.4.7.1 Review and approval of minutes of previous meetings

1.4.7.2 Review of progress of Contract Deficiency corrections

1.4.7.3 Identification of problems impeding Contract Deficiency correction

1.4.7.4 Review of outstanding Contract Deficiencies and year-end Warranty items

1.5 COMMISSIONING MEETINGS

1.5.1 Coordinate requirements of commissioning meetings with Division 01 – General Commissioning Requirements and Section 01 35 21 – LEED® General Requirements.
1.5.2 Commissioning Kick-Off Meeting:

1.5.2.1 Commissioning Agency (CxA) will schedule a commissioning kick-off meeting shortly after award of Contract; this meeting will be separate from the other meetings specified in this Section.

1.5.2.2 Purpose: Outline the commissioning process and identify the roles and responsibilities of each team member in the commissioning process during the construction phase.

1.5.2.3 Location: To be determined.

1.5.2.4 Attendees: Construction Manager’s representatives, affected Trade Contractor’s representatives, the Consultant and Subconsultants, the Owner and their operations and maintenance personnel.

1.5.2.5 Agenda:

1.5.2.5.1 Review specific equipment submittals for systems that will be commissioned to verify that equipment used to establish the Contract Price is in compliance with the design intent.

1.5.2.5.2 CxA will identify commissioning related milestones in the order they are to be completed; these commissioning milestones shall be incorporated into Construction Manager’s Construction Schedule.

1.5.2.6 Minutes: CxA will record minutes and distribute copies to attendees and other identified parties prior to the start of the first regularly scheduled commissioning meeting.

1.5.3 Scheduled Commissioning Meetings:

1.5.3.1 CxA will schedule regular commissioning coordination meetings throughout the construction phase, timing and duration will be determined at the first meeting.

1.5.3.2 Purpose: To convey the importance of the commissioning process, to provide notice for upcoming commissioning milestones, and identify any outstanding issues or adjustments to systems or assemblies required to meet indicated performance values.

1.5.3.3 Attendees: Construction Manager’s representatives, affected Trade Contractor’s representatives, the Consultant and Subconsultants, the Owner and their operations and maintenance personnel.

1.5.3.4 Agenda:

1.5.3.4.1 Confirmation that Consultants have reviewed submittals and identify CxA’s verification test procedures and system readiness checklists for the equipment that will be installed.

1.5.3.4.2 Review the TAB reports to verify that all systems have been accurately balanced and are operating within the specified design parameters, and identify any outstanding requirements or deficiencies.

1.5.3.5 Minutes: CxA will record minutes and distribute copies to attendees and other identified parties prior to the start of the next regularly scheduled commissioning meeting.
1.6 PRE-INSTRUCTION CONFERENCE

1.6.1 Coordinate requirements for Pre-Instruction Conference with Section 01 79 00 – Demonstration and Instruction, and as follows:

1.6.1.1 Purpose: To inspect and discuss locations and other facilities required for instruction.

1.6.1.2 Attendees: Construction Manager’s representatives, affected Trade Contractor’s representatives; training facilitators, instructors and documentation specialists; the Consultant and Subconsultants; the Owner and their operations and maintenance personnel.

1.6.1.3 Agenda:

1.6.1.3.1 Review and finalize instruction schedule and verify availability of educational materials, instructors’ personnel, and facilities needed to avoid delays.

1.6.1.3.2 Review required content of instruction.

1.6.1.3.3 Review weather and forecasted weather conditions and procedures to follow if conditions are unfavourable for instruction that must occur outside during inclement weather.

1.6.1.4 Minutes: The training facilitator will record minutes and distribute copies to attendees and other identified parties prior to the start of the next regularly scheduled pre-instruction conference.

2 Products

2.1 NOT USED

3 Execution

3.1 NOT USED

END OF SECTION
1 General

1.1 INTENT

1.1.1 This Section intends to provide information and a guideline that may be used to establish acceptable formats and technology agreed upon by all project participants for the transfer and use of electronic documents and BIM Project Files and is not intended to establish unnecessary burdens for coordination and production by any of the parties involved with delivery of the Project.

1.1.2 Consultant intends that the 2D drawing files, addenda and bid modifications issued during the bidding phase and identified as the Contract Documents will be used as the primary documentation for administration of the project.

1.1.3 Any electronic files shared as a result of this section are intended to be used cooperatively and for the convenience of the Construction Manager for delivery of project specific requests; sharing of electronic files with Trade Contractor, suppliers, fabricators and others contributing to the Project is also encouraged within the limitations stated within this Section.

1.1.4 Consultant can withdraw their intent to share electronic documents for any reason and at any time where it sees that the collaborative process, respect for the nature and development of electronic documentation is missing or where infringements on copyright or agreed upon terms of usage are not respected.

1.2 SUMMARY

1.2.1 This Section includes suggested methods for establishing an Electronic Communications Protocol for the project including sharing of Building Information Modelling (BIM) Project Files, and is intended to assist with communications management and consistency by establishing protocols, procedures and limitations for the following:

1.2.1.1 Interoperability, compatibility and formats of system components used to convey information.

1.2.1.2 Use of BIM Project Files for preparation of estimates, preparation of submittals and scheduling by the Construction Manager, Trade Contractors and others contributing to the electronic documentation for the Project.

1.2.1.3 Methods for reincorporation of shop and fabrication drawings, record information, commissioning performance values and other model elements created by Construction Manager, Trade Contractors and others contributing to the electronic documentation back to BIM Project Files by the parties responsible for creating that documentation, and who is not the Consultant.

1.2.1.4 Methods for protection and preservation of interchanged and exchanged data, ownership of information and protection of proprietary or confidential information.

1.2.1.5 Administration and sharing of Electronic Communications including an agreed upon and formalized process for sharing information and establishing standards for software and data exchange; defined as a Project Execution Plan (PxP) within this Section.

1.2.2 This Section provides intent and direction that allows project participants to input or extract information within BIM Project Files used throughout the construction process, and includes a BIM Project Execution Plan that allows project participants to determine the level for which a BIM Project Files or models may be used.
1.2.3 Consultant is providing BIM Project Files in native formats where applicable and in generic conversion file using agreed upon generic formats to aid in document production for the convenience of the Construction Manager, Trade Contractors and others contributing to the electronic documentation process described in this Section.

1.3 RELATED REQUIREMENTS

1.3.1 Section 01 11 00 – Summary of Work: Use of specifications and drawing documents for administration of the project and identification of construction progress documentation.

1.3.2 Section 01 31 13 – Project Coordination: Electronic project management software systems used for administration of the Contract.

1.3.3 Section 01 33 00 – Submittal Procedures: Paperless document submission requirements for shop drawings, product data and other submissions.

1.3.4 Section 01 35 31 – LEED® Special Project Procedures

1.3.5 Section 01 78 23 – Electronic Operation and Maintenance Data: Paperless operation and maintenance data documentation and project closeout tracking procedures.

1.4 DEFINITIONS

1.4.1 Contract Documents: Drawings, specifications and schedules, addenda and bid revisions and other documents issued during the Bid Period and that are listed in the Articles of Agreement in the Contract; BIM Project Files are issued for the convenience of the Construction Manager and are not Contract Documents.

1.4.2 Building Information Modelling (BIM) Project Files: A virtual representation of the physical and functional characteristics of the project through an accumulation of information at various design and documentation stages of development starting from project inception through to completion, and that is authored by different parties as a result of the IPD process throughout the project’s lifecycle.

1.4.3 Electronic Communications Protocols (ECP): Mutually agreed upon electronic communications formats that will be used to convey information for drawings and models, BIM Project Files and databases, text and other computer based proprietary electronic information interchange and communication software.

1.4.4 Integrated Project Delivery (IPD): Collaborative project delivery approach that integrates people, systems, business structures and practices intended to reduce optimize efficiency for the design, fabrication and construction of the Work of the Contract Documents.

1.4.5 BIM Project Execution Plan (BIM PxP): Template prepared by the Consultant and completed collaboratively with the Construction Manager to establish structured procedures for administration of the BIM PxP covering the following example components, which can be adjusted or expanded where project requirements dictate a different process:

1.4.5.1 Identification of BIM Goals and Uses
1.4.5.2 Design BIM Project Execution Process
1.4.5.3 Develop Methods for Information Exchange
1.4.5.4 Define Supporting Infrastructure for the BIM Process

1.4.6 Model Component Authors (MCA) are defined as follows:
1.4.6.1 Consultant (C): Entity described as Consultant in Contract documents and that is responsible for professional design services and has primary responsibility as the Design Professional of Record for purposes of Code Compliance.

1.4.6.2 Prime Constructor (PC): Defined as Construction Manager in Contract Documents.

1.4.6.3 Trade Contractors (TC): Defined as Trade Contractor in Contract Documents.

1.4.6.4 Suppliers (S): Not defined in Contract Documents, listed as supplier, fabricator, manufacturer or other project participants as appropriate to procurement requirements.

1.4.7 Level of Development (LOD): Stages of model and documentation production based on a range of values making up the Level of Development as developed by the Model Component Authors (MCA) starting at conceptualization and incorporating progressive levels of development through incorporation of design criteria as follows:

1.4.7.1 Detailed design and implementation documentations are ranked as LOD ranges starting from 0 to 500 matched against MCA responsibilities.

1.4.7.2 LOD is measured in minimum increments of 25 to assess progress, or indicate changes to conditions or development within each LOD category.

1.4.7.3 LOD for issued models and documentation may contain a range of development throughout the project delivery process and are not intended to indicate absolute stages of completion.

1.4.7.4 LOD stages listed below are guidelines for interpretation of the model and documentation; and are not intended to be interpreted as sharply defined criteria:

1.4.7.4.1 LOD 0 to 100 - Conceptual Information: High level massing and analysis information and documentation, and preliminary BIM Project Files typically prepared by the Consultant and may include building volume and orientation studies, preliminary investigations for pricing, material and assembly types.

1.4.7.4.2 LOD 100+ to 200 - Schematic Design and Design Development: BIM Project Files forming a part of the schematic and detailed design phases that are typically prepared by the Consultant and may include approximate geometries, generalized system and assembly descriptions, generalized performance criteria and project budgeting.

1.4.7.4.3 LOD 200+ to 300 - Construction Documents: BIM Project Files developed during construction documentation phase and typically prepared by the Consultant; and may contain design assistance from Construction Manager for production of traditional 2D plans, elevations and sections, and specifications used as a part of Contract Documents; may also be used by the Construction Manager for Consultant authorized purposes such as preliminary construction layouts and other uses identified through the IPD and PxP.
1.4.7.4 300+ to 400 - Fabrication Information: BIM Project Files that are prepared by Trade Contractors, fabricators, manufacturers and suppliers with design assistance or feedback from the Construction Manager and Consultant for development of detailed shop drawings, fabrication layouts and other uses outside of the services agreed upon by Consultant's and Owner.

1.4.7.4.5 400+ to 500 - Project Closeout: BIM Project Files relating to project closeout, record drawings and specifications, identification of as-built Information and similar information; BIM Project Files may be suitable for use in operation and maintenance of the facility if required by the Owner, and which typically require preparation by project participants as defined by contractual relationships established for the project.

1.4.7.5 Example LOD Input Form with MCA Responsibilities:

<table>
<thead>
<tr>
<th>UniFormat Building Element Classification</th>
<th>Level of Detail (LOD) and Model Component Author (MCA)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Conceptualization</td>
</tr>
<tr>
<td></td>
<td>LOD</td>
</tr>
<tr>
<td>A Substructure</td>
<td>A10</td>
</tr>
<tr>
<td></td>
<td>A1010</td>
</tr>
<tr>
<td></td>
<td>A1020</td>
</tr>
<tr>
<td></td>
<td>A1030</td>
</tr>
<tr>
<td>A20 Basement Construction</td>
<td>A20</td>
</tr>
<tr>
<td>B Shell</td>
<td>B10</td>
</tr>
<tr>
<td></td>
<td>B1020</td>
</tr>
<tr>
<td></td>
<td>B20</td>
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<td></td>
<td>B2020</td>
</tr>
<tr>
<td></td>
<td>B2030</td>
</tr>
<tr>
<td>B30 Roofing</td>
<td>B30</td>
</tr>
<tr>
<td></td>
<td>B3010</td>
</tr>
<tr>
<td></td>
<td>B3020</td>
</tr>
</tbody>
</table>

1.5 REFERENCE STANDARDS

1.5.1 Minister of Justice, Government of Canada:

1.5.1.1 Consolidation, Copyright Act, current to May 7, 2010
1.6 ADMINISTRATIVE REQUIREMENTS

1.6.1 Reliance on ECP: Project participants may use ECP prepared in the formats and transmission methods identified in this Section with the following understandings:

1.6.1.1 BIM Project Files may be revised by project participants at any time during the course of the Work and are not considered as a complete or accurate representation of the final construction.

1.6.1.2 BIM Project Files may represent imperfect data and may contain errors, omissions, conflicts, inconsistencies and improper application of information relating use of materials.

1.6.1.3 BIM Project Files do not constitute Contract Documents; they are issued for information purposes only to aid in the administration of the Work of the Project.

1.6.1.4 BIM Project Files are available at the users own risk; Consultant may choose to correct deficiencies identified by the user when identified if there is benefit to the remainder of the Work of the Project, or provide clarification where the identified deficiency does not affect interpretation of BIM Project Files.

1.6.2 Coordination: This project will use a formalized computer technology protocol to interchange information and documents electronically to aid in improved productivity by providing records of data conveyance, and helping to reduce time and cost necessary to convey project information using manual or non-electric methods, File Transfer Protocol (FTP) sites, Heterogeneous Computing and Storage Communities (“the Cloud”) or other acceptable file transfer processes.

1.6.3 Integration with Contract Documents: The terms and conditions of Construction Manager’s Agreement with the Owner, subsequent Trade Contractor agreements and supplier purchase orders are extended to include:

1.6.3.1 Governance: The two-dimensional hard copy drawings and specifications (Project Manual), addenda and bid modifications issued during the Bid Period and listed in the Contract govern in the first instance where discrepancies or differences occur with electronic documents:

1.6.3.1.1 The Consultant will not provide any interpretation arising from the use of electronic documents.

1.6.3.1.2 Electronic documents are provided by the Consultant for the convenience of the Construction Manager.

1.6.3.2 Defined Terms: Defined terms used in this Section have the same meaning as set forth in the governing agreements used for administration of the Project.

1.6.4 Data Exchange and Interoperability: Electronic Communication will be provided in the native format used by the Consultant to prepare BIM Project Files and transfer protocols agreed upon between the Owner, Consultant and Construction Manager and as follows:

1.6.4.1 Consultant will not be responsible for conversion of ECP to other formats, and subsequent disconnects or conflicts arising from sharing of information, data, elements, families or object identification between different software systems, users and vendors.
1.6.4.2 Construction Manager, Trade Contractors, suppliers, fabricators and manufacturers will be solely responsible for data integrity arising from conversion required for use by non-native format software applications not forming a part of the ECP.

1.6.4.3 Construction Manager, Trade Contractors, suppliers, fabricators and manufacturers will be responsible for providing information that is fully compatible with BIM Project Files and transfer protocols agreed upon for the Project.

1.6.5 Liability: Consultant informs the Construction Manager, Trade Contractors, suppliers, fabricators and manufacturers that BIM Project Files contains information that suggest directions for solving major design requirements and is subject to the following provisions:

1.6.5.1 Consultant makes no claim as to the accuracy of BIM Project Files or the interpretations made by subsequent developers and contributors to BIM Project Files for their individual contributions; control of the Work remains with the Construction Manager in accordance with the General Conditions of the Contract.

2 Products

2.1 DOCUMENTATION

2.1.1 BIM Project Files Prepared by Consultant: Consultant has created electronic databases, building models, drawings, specifications and other documentation that will be used to communicate the requirements of the project and administer the Contract and will share this information with the Construction Manager under the following conditions:

2.1.1.1 Construction Manager accepts that the Consultant cannot provide any assurance that any file translation or conversion of the agreed upon ECP established by this section into other software formats will be free from errors.

2.1.1.2 Construction Manager accepts that the Consultant makes no representation as to the accuracy or completeness of BIM Project Files, that information presented may be incomplete; and that dimensions may not represent precise geometries required by the Construction Manager.

2.1.1.3 Construction Manager accepts that the accuracy of BIM Project Files is limited to the respective LOD of each element or category of elements as specified in the BIM PnP.

2.1.2 BIM Project Files Prepared by Construction Manager: Construction Manager will use ECP established by this Section and related requirements to convey project information to Trade Contractors and others for the benefit of the Project as follows:

2.1.2.1 Consultant’s limitations for use of BIM Project Files and ECP are communicated to subsequent MEA’s and that subsequent MEA’s are required to share their BIM Project Files openly with other project participants using the same ECP indicated in this Section.

2.1.2.2 Construction Manager will remain responsible for establishing and confirming site dimensions and project conditions, and resolving constructability means and methods in accordance with the requirements of the Contract Documents.
2.1.2.3 Construction Manager accepts that information transmitted by the Consultant represents the current state of BIM Project Files effective at the date the electronic file is produced and that the Consultant will not issue updated versions of BIM Project Files except at their sole discretion.

2.1.2.4 Consultant will not respond to formal Requests for Interpretation (RFI’s) relating to BIM Project Files; Consultant will only respond to RFI’s relating to Contract Documents.

2.1.2.5 Construction Manager, Trade Contractors and others will work collaboratively and cooperatively with the Consultant to derive acceptable solutions using informal forms of communications where clarifications to BIM Project Files are required.

3 Execution

3.1 PREPARATION

3.1.1 Review of Documents: Information contained in BIM Project Files may change during the evolution of the project as a result of changes made by the Consultant and other contributors to BIM Project Files; it remains the responsibility of the Construction Manager, Trade Contractors, suppliers, fabricators and manufacturers to confirm that the information they are using is current to the project stage.

3.2 APPLICATION OF ELECTRONIC COMMUNICATIONS PROTOCOL

3.2.1 Ownership of Data: Consultant retains control and ownership of data they created and that is contained within BIM Project Files in accordance with the Copyright Act and strictly limits use of the BIM Project Files transmitted using the ECP as follows:

3.2.1.1 Consultant retains sole ownership of design concept, and intellectual and confidential content contained within BIM Project Files, and specifically restricts adaptation or reuse of electronic information from use on other projects regardless of medium or method of information transfer including conventional drawings and specifications, BIM or other communication strategy.

3.2.1.2 Consultant permits the use of BIM Project Files for production of derivative content appended to and provided by the Construction Manager, Trade Contractors, suppliers, fabricators and manufacturers.

3.2.1.3 Consultant states that electronic information contained in BIM Project Files is prepared exclusively for Work required by the Contract Documents and retains sole right to produce, reproduce and publish in electronic or paper format any information contained in BIM Project Files required whether prepared by themselves or by others contributing to BIM Project Files.

3.2.1.4 Contributors have the ability to develop additional information to provide families, elements and host entities that adhere to the aesthetic and technical criteria established using the PxP, BIM Project Files, drawings and specifications provided by the Consultant.

3.2.1.5 Consultant recognizes concepts of the IPD process and that there may be multiple parties claiming ownership of a portion of the final BIM Project Files as a result of the ECP established by this Section and respects these rights on the condition that the information is shared using similar conditions as those stated by the Consultant in this Section and confirms that project specific confidential information contained within electronic documents will not be shared outside of BIM Project Files.
3.2.2 BIM Project Files Usage: Consultant may attempt to provide clarification arising from conflicts, inconsistencies or clarifications resulting from the use of BIM Project Files where these discrepancies affect interpretation of BIM Project Files as follows:

3.2.2.1 Consultant is a contributor of BIM Project Files for the duration of the conceptual design, schematic design, design development, construction documentation and bidding phases of the Work; Consultant will accept and incorporate information from the Construction Manager during these phases where discrepancies have potential to affect cost or interpretation of BIM Project Files at the sole discretion of the Consultant.

3.2.2.2 Consultant and Construction Manager will jointly contribute to the BIM Project Files for the duration of the construction phase and will work cooperatively to resolve discrepancies in BIM Project Files to the benefit of the project.

3.2.2.3 Consultant and Construction Manager will work cooperatively during the commissioning and take over phases of the Work to incorporate information specifically assigned to them through the obligations of their respective contracts with the Owner, and are not compelled to undertake modifications that they have not been specifically assigned and compensated by the terms of those contracts.

3.2.2.4 Owner is the contributor of the BIM Project Files after final closeout and completion of the Work; Consultant and Construction Manager agree to contribute to the BIM Project Files in accordance with their respective contractual obligations.

3.2.3 Recognized Uses of BIM Project Files: Consultant recognizes that there are many potential uses for BIM Project Files for all project participants including the Consultant, their Subconsultants, the Construction Manager, Trade Contractors, suppliers, fabricators and manufacturers as follows:

3.2.3.1 Generality of Uses: The recognized uses of BIM Project Files listed in this Section are a guideline of potential uses, and does not stipulate that any or all of recognized uses will be provided for the project by the Consultant:

3.2.3.1.1 Contract Documents govern where discrepancies arise within BIM Project Files for any of the uses listed in this Section.

3.2.3.2 Design and Coordination: Representations of form, function and relationships, technical information and communication strategies in the form of the following:

3.2.3.2.1 Conceptual: Non-geometric data or line work representing volumes, zones and areas.

3.2.3.2.2 Approximate Geometry: Generic elements shown in three dimensions to establish maximum size and purpose.

3.2.3.2.3 Precise Geometry: Specific elements using Basis-of-Design Materials or Confirmed Materials; use of three dimensional objects for indicating geometry is not intended to indicate actual dimensions, capacities or connections.

3.2.3.2.4 Fabrication: Production of shop or fabrication drawings and delegated design calculations used for confirmation prior to purchase, manufacture and installation of specified products.
3.2.3.2.5 As Constructed: Incorporation of as-constructed information indicating actual products and locations of actual installations concealed in final construction.

3.2.3.3 Scheduling: Major elements relating to design and construction duration as follows:

3.2.3.3.1 Conceptual: Identification of total project construction duration including design and construction documentation, and phasing of major elements.

3.2.3.3.2 Approximate Geometry: Indication of time scale and ordered appearance of major activities.

3.2.3.3.3 Precise Geometry: Indication of time scale and ordered appearance of detailed assemblies and activities.

3.2.3.3.4 Fabrication: Indication of fabrication and assembly detail including construction means and methods, use of cranes, man lifts and shoring, and other site activities and temporary facilities.

3.2.3.3.5 As Constructed: Identification of temporary facilities remaining as a part of permanent construction.

3.2.3.4 Estimating: Budgeting and cost control during design; and value engineering during construction as follows:

3.2.3.4.1 Conceptual: Indication of conceptual cost allowances based on floor area and unit rates including any assumptions for future content.

3.2.3.4.2 Approximate Geometry: Estimated costs based on measurement of generic elements and families; Consultant may choose to import manufacturer specific elements or families for convenience only, any use of manufacturer specific elements or families is intended for use as a placeholder within the model to indicate relationship of model components.

3.2.3.4.3 Precise Geometry: Estimated costs based on measurement of specific assemblies and components; use by the Consultant of imported manufacturer specific elements or families does not constitute acceptance of that manufacturer’s product as the Basis-of-Design Material, nor a representation of precise geometry.

3.2.3.4.4 Fabrication: Committed purchase price of specific assemblies at award of contract.

3.2.3.4.5 As Constructed: Record of actual costs arising from changes during construction and delivery of project.

3.2.3.5 Program Compliance: Design and user needs assessments based on building type and expected use as follows:

3.2.3.5.1 Conceptual: Gross areas and arrangements.

3.2.3.5.2 Approximate Geometry: Specific room and area requirements.

3.2.3.5.3 Precise Geometry: Furniture, fittings and equipment, casework and other built in components, and utility connections.
3.2.3.6 Sustainable Materials: Tracking sustainable design and construction activities and materials as follows:

3.2.3.6.1 Conceptual: Identification of sustainable strategies.
3.2.3.6.2 Approximate Geometry: Proposed sustainable materials and quantities based on design categories.
3.2.3.6.3 Precise Geometry: Precise assessment and quantities with performance requirements mapped to materials.
3.2.3.6.4 Fabrication: Specific manufacturer selections based on performance requirements and inclusion of substantiating literature.
3.2.3.6.5 As Constructed: Commissioning and recording of measured performance of operating components, verification of durability of materials and quality control measures.

3.2.3.7 Environmental Control: Lighting, energy use, air movement analysis and simulation as follows:

3.2.3.7.1 Conceptual: Strategies and performance criteria incorporated based on volumes and areas.
3.2.3.7.2 Approximate Geometry: Conceptual design based on geometry and assumed system types and components.
3.2.3.7.3 Precise Geometry: Approximate simulations based in specific building assemblies and engineered systems.
3.2.3.7.4 Fabrication: Precise simulation based on specific manufacturer and detailed system components.
3.2.3.7.5 As Constructed: Commissioning and recording of actual measured performance, and training requirements for building operators and facility managers.

3.2.3.8 Model Elements: Component parts such as wall construction and ducts, exiting and circulation, code compliance and similar information are included as follows:

3.2.3.8.1 Conceptual: Generally not modelled, unit costs and other information may be included.
3.2.3.8.2 Approximate Geometry: Generic three dimensional information and approximate dimensions and thicknesses may be included along with broad performance parameters such as sound ratings or u-values as a range.
3.2.3.8.3 Precise Geometry: Specific construction and dimensions indicated, and precise engineering data are included where delegated design is a requirement.
3.2.3.8.4 Fabrication: Manufactured configuration with precise engineered dimensions and fabrication details required to meet project requirements.
3.2.3.8.5 As Constructed: Actual installed configurations, assemblies and standards of installed components are recorded as a part of the BIM Project Files released to Owner.
3.3 USE OF ELECTRONIC BIM DOCUMENTS

3.3.1 BIM Project Files of the Consultant: BIM Project Files may be made available to Construction Manager by Consultant at their sole discretion subject to the following conditions:

3.3.1.1 Construction Manager is required to sign the Consultant’s standard terms of usage and electronic file acceptance disclaimer; samples of these documents are attached to this Section.

3.3.1.2 Construction Manager is required to provide a list of all Trade Contractors and other potential MCA’s that will have access to the BIM Project Files; failure to provide a list of Trade Contractors and potential MCP’s will result in the Consultant withdrawing their offer to share BIM Project Files.

3.3.1.3 Construction Manager is required to provide an estimate of time savings to the project attributable to use of BIM Project Files.

3.3.1.4 BIM Project Files will be made available at no cost to the Construction Manager in Revit format software used to prepare BIM Project Files, along with a NavisWorks file that can be used for coordinating of non-supported software.

3.3.1.5 BIM Project Files will be provided by DVD or FTP Site, depending on size of BIM Project Files.

3.3.1.6 BIM Project Files will be provided in the file format used for production of drawings, a change to the version or format will not be undertaken by Consultant; Construction Manager is responsible to hire an outside service to change documents where formats do not meet their ability to read them.

3.3.1.7 Direct requests for BIM Project Files from Trade Contractors will not be considered by Consultant.

3.3.1.8 Consultant reserves the right to alter BIM Project Files information not essential to Contract from materials provided to Construction Manager including the following:

- Remove Title Blocks and Logos
- Remove Professional Seals
- Remove Detail Components and Families
- Bind External Files

3.3.2 Construction Manager is responsible for coordinating Trade Contractor requests for BIM Project Files; Construction Manager must request BIM Project Files at beginning of Work:

3.3.2.1 Consultant makes no warranty or guaranty that dimensions provided or established from BIM Project Files represent actual site conditions.

3.3.2.2 Construction Manager remains responsible for establishing and confirming site dimensions and project conditions, and providing this information to affected Trade Contractors.

3.3.2.3 The Contract Documents will govern in the event that there is a discrepancy between BIM Project Files provided to Construction Manager and Contract Documents.

3.3.2.4 In the event that dimensions are not indicated, they must not be scaled electronically from BIM Project Files; missing dimensions must be brought to the attention of Consultant, who will determine dimensions or direct method for determination of missing dimensions.
3.3.3 Construction Manager recognizes that use of BIM Project Files is at their own risk. Construction Manager will be required to sign terms of usage accepting use that may include the following:

3.3.3.1 Construction Manager, Trade Contractor, Sub-Trade Contractor, supplier, manufacturer, or other third party agent agrees to indemnify and hold harmless Consultant from any damage, liability or costs arising from the use of BIM Project Files conveyed in file format provided.

3.3.3.2 Consultant retains the copyright for proprietary information, and unique technical and design methods contained within BIM Project Files created by the Consultant; this content is made available to Construction Manager for information purposes only.

3.3.3.3 Use of supplied BIM Project Files for any subsequent Project is strictly forbidden without express written consent of Consultant.

3.3.3.4 Consultant will not be held liable of any unauthorized use or modification of BIM Project Files provided.

3.3.3.5 Consultant assumes no responsibility for work produced by the Construction Manager and Trade Contractor’s.

3.3.3.6 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 BIM Project Files and format provided, whether resulting from negligence, accident or any other cause.

3.3.4 Consultant reserves the right to withdraw the offer for BIM Project Files for any reason and at any time where an excessive number of requests are made for BIM Project Files or where the Consultant deems that sharing BIM Project Files have the potential to modify design decisions that compromise the Consultant’s responsibilities under the Professionals Act for documents produced under seal by an architect or engineer.

3.3.5 Consultant reserves the right to reject shop drawings prepared from BIM Project Files submitted to them by Construction Manager that have not been substantially altered from BIM Project Files provided, and as follows:

3.3.5.1 Shop Drawings shall reflect constructability requirements.

3.3.5.2 Shop Drawings shall be detailed in accordance with requirements listed in technical specification sections.

3.4 BIM PROJECT EXECUTION PLAN (PxP)

3.4.1 Consultant will provide a sample BIM PxP that will be used to develop a collaborative execution plan with the Owner, Consultant, Construction Manager and others involved with developing and sharing BIM Project Files.

3.4.2 Use of BIM PxP: The BIM PxP is not a considered a Contract Document; it is developed by the project participants and its use is intended as a guideline resource only.

3.4.3 Key Project Participants: Provide names, addresses and contact information for the following participants:

3.4.3.1 Owner Team

3.4.3.2 Consultant Team including Subconsultants and Sub-Subconsultants

3.4.3.3 Constructor Team including Trade Contractors and Sub-Trade Contractors, and Material Suppliers and Fabricators

3.4.3.4 Others as necessary to the project
3.4.4 Project Goals: Provide goals and descriptions of how BIM Project Files will be used (Planning, Design, Documentation, Construction, and Operation) to maximize project value to the Owner; content may contain some of the following example usages:

3.4.4.1 Design Alternatives
3.4.4.2 Life Cycle Analyses
3.4.4.3 Scheduling
3.4.4.4 Estimating
3.4.4.5 Material Selection
3.4.4.6 Prefabrication
3.4.4.7 Site Placement
3.4.4.8 Other categories proposed as beneficial to project delivery

3.4.5 BIM Roles and Responsibilities: Identify personnel, hardware and software required for successful coordination of BIM Project Files as follows:

3.4.5.1 BIM Managers: Identify qualified individuals representing the Design Team and the Construction Team who will become the primary points of contact for BIM related issues.
3.4.5.2 Project Collaboration: Establish location for FTP project server where exchange of BIM Project Files can be shared using agreed upon passwords and access privileges.
3.4.5.3 Collaboration Procedures: Establish collaboration strategies and meeting procedures including project Kick-Off, communication strategies, and development of PxP, design coordination, construction reviews and other BIM meetings.
3.4.5.4 Quality Control: Agree to quality control measures that could include visual checks, interference checks, standards check and model integrity checks.
3.4.5.5 Model Organization: Agree to file naming standard, model structure and measurement and coordinate systems.

3.4.6 Listing of Software: Identify software packages that will be used for communications and production of information for the benefit of the project including the following:

3.4.6.1 Portable Document Format (PDF): Adobe Acrobat or other software capable of producing compatible PDF documents; such as Bluebeam PDF, will be used for paperless electronic documentation of Drawing Sheets, Project Manual (Specifications), Addenda and Bid Modifications; Contract Administration Documents, Requests for Interpretation, Progress Claims and similar documents that do not require subsequent detailed editing:

3.4.6.1.1 Version: Adobe Acrobat 9 with compatibility set for Acrobat 5.0.
3.4.6.1.2 Security: Password Security enabled with compatibility set for Acrobat 7.0; encryption set for all document contents; permissions set for High Resolution Printing; Changes set to None; Copying of Text, Images and Other Content checked Off; Text Access for Screen Reader Devices checked On.
3.4.6.1.3 Change Permission Password: As agreed upon by all Parties.
3.4.6.1.4 Document Open Password: Not required.
3.4.6.2 Editable Document Format: Microsoft Word or Excel will be used for editable electronic documents shared between applications requiring creation of new and original text, and modifiable documents:

3.4.6.2.1 Version: Microsoft Office 2007 with compatibility set to *.docx file extension.
3.4.6.2.2 Security: Not required.

3.4.6.3 Modelling Format: Autodesk Revit Architecture, Autodesk Revit MEP and Autodesk Revit Structure will be used to create and modify three dimensional model information and to create views depicting Plans, Elevations, Sections and Details, Schedules and Tables, and will also be made available for the purposes of creating Construction Schedules and Cost Estimates, preparation of Shop Drawings and other Fabrication Information, As Constructed information, and Commissioning documents:

3.4.6.3.1 Version: Revit 2011.
3.4.6.3.2 Security: Not Required.

3.4.6.4 Drafting Format: Autodesk AutoCAD will be used for non-model related 2D and 3D dimensional graphical information for incorporation into BIM Project Files as an underlay or as an element that will be converted into a Revit Family or Entity:

3.4.6.4.1 Version: AutoCAD 2010.
3.4.6.4.2 Security: Not Required.

3.4.6.5 Electronic Project Management Software Systems: Onware will be used for project management software to track and manage Project to manage requests for interpretation, construction communications, change directives and change orders for the Project; the Consultant’s version of software will be considered as the official record for project in accordance with Section 01 31 13:

3.4.6.5.1 Format: Construction Manager may use their own electronic management software for managing their in-house operations, but will be required to use Onware for submission of Requests for Interpretation (RFI’s), Progress Claims and other administration documentation in one of the portable or editable document formats listed.

3.4.7 BIM and Facility Data Requirements: Establish an agreed BIM Output Matrix for design and fabrication information based on an elemental breakdown of model components in 2D, 3D and 4D as required to facilitate exchange of facility data.

3.1 TERMS OF USAGE

3.1.1 Letter for Terms of Usage: Consultant’s sample letter for terms of usage requires acknowledgement and acceptance by Construction Manager and is attached to this Section for reference purposes; sample terms of usage may be adjusted to reflect project specific conditions.

3.1.2 Electronic Document Sharing Disclaimer: Consultant’s document sharing disclaimer must be accepted to open transmitted documents sent to the Construction Manager and is attached to this Section for reference purposes.
APPENDIX A – SAMPLE LETTER FOR TERMS OF USAGE

[Date]

Construction Manager

[Address]

Attention: [Construction Manager’s Project Manager]

Re: Terms of Usage for Sharing Electronic Design and Drawing Files in BIM Formats

[Name of Project]
[Project Number]
[City, Province]

Further to your request for a copy of our BIM Project Files for the above named project, DIALOG® is willing to share our electronic design and drawing files once we have received an original signed copy of this letter indicating your acceptance of the Terms of Usage bearing the signature of a principal within your company having signing authority and who will have responsibility for BIM Project Files, and a complete list of potential Trade Contractors and Model Component Authors.

Signing the Terms of Usage indicates your acknowledgement and acceptance that the transmitted BIM Project Files may represent an imperfect data set with the potential to contain errors, omissions, conflicts, inconsistencies, improper use of modelling components and other inaccuracies. The Level of Development provided by DIALOG® is appropriate to our contractual services and are not intended to represent construction geometry, means and methods for project delivery or other detailed information associated with Levels of Development that form the contractual responsibilities of the Construction Manager:

- Information contained in BIM Project Files does not form part of the Contract Documents and is transmitted for information purposes only and is used at your own risk.
- Contract Documents will govern in the event that there is a discrepancy between BIM Project Files and the Contract Documents; DIALOG® will not respond to Requests for Interpretation (RFI’s) arising from use of BIM Project Files.
- The information transmitted represents the current state of BIM Project Files on the date the electronic file is produced; DIALOG® will not issue updated versions of BIM Project Files except at DIALOG®’s sole discretion.
- Construction Manager will remain responsible for establishing and confirming site dimensions and project conditions, and resolving construction issues associated with the Work in accordance with the requirements of the Contract Documents.

The information you have requested is being transmitted using the Autodesk Revit® format used for production of BIM Project Files and in Autodesk Navisworks® file sharing format, which contains the electronic design and drawing files created by DIALOG®:

- BIM Project Files will be issued in a self-extracting file format that requires additional acceptance of an electronic disclaimer, and will be available from an FTP site established by DIALOG®’s BIM Manager.
- Construction Manager must obtain additional signatures for each Trade Contractor that they are sharing BIM Project Files with and establish procedures that bind their Trade Contractors to the same Terms of Usage established in this letter and as described in the project specifications.
- Construction Manager are permitted to share this information only with Trade Contractors working on this project; neither the Construction Manager nor their Trade Contractors will be permitted to transmit or share the information contained in BIM Project Files to any third party.
The information contained in BIM Project Files are provided for the convenience of the Construction Manager, who agrees to indemnify and hold harmless DIALOG® to the fullest extent permitted by law from any damage, liability or costs including and without limitation for any special, indirect or consequential damages arising from use of BIM Project Files.

DIALOG® assumes no responsibility and disclaims any liability to any person or entity for any loss or damages including and without limitation any special, indirect or consequential damages caused by errors or omissions contained within BIM Project Files, whether resulting from negligence, accident or other cause.

Please contact the writer directly with any questions regarding the content of these Terms of Usage.

Respectfully,

DIALOG® [Alberta Architecture Engineering Interior Design Planning Inc.]

[Signed by DIALOG® Managing Principal]

Terms of Usage Acknowledged and Accepted by:

Insert name of Construction Manager:

Name (print)  Title  Date

________________________________________

Signature

Insert names of Trade Contractors and other Model Content Authors, and name and title of responsible parties that will be receiving BIM Project Files:

Name of Company

Name of Responsible Party (print)  Title  Date

Name of Company

Name of Responsible Party (print)  Title  Date

Name of Company

Name of Responsible Party (print)  Title  Date

Name of Company

Name of Responsible Party (print)  Title  Date

Name of Company
(Provide additional sheets as necessary)
APPENDIX A
DISCLAIMER FOR ELECTRONIC FILES SHARED WITH CONTRACTORS

DIALOG will transmit electronic files containing the Autodesk Revit® architectural building design electronic model. The following text will appear when the self-extracting file is opened:

"By executing this self-extracting file, the user agrees that they will be bound by the following conditions and disclaimers:

1. The information in the self-extracting file does not form part of the Contract Documents.
2. The user shall not transmit the information in the self-extracting file to any third party.
3. DIALOG makes no warranty or guaranty that information provided or established from the transmitted electronic documents represents actual site conditions, as acknowledge and accepted by the signed Terms of Usage previously submitted.
4. The information in the self-extracting file is provided for the convenience of the user. The user agrees to indemnify and hold harmless DIALOG to the fullest extent permitted by law from any damage, liability or costs (including, without limitation, special, indirect or consequential damages) arising from the information. DIALOG is not liable for any unauthorized use of information in the self-extracting file such as:
   • Use of supplied electronic files for any subsequent Project is strictly forbidden without express written consent of DIALOG.
   • DIALOG will not be held liable for any unauthorized use or modification of electronic files provided.
   • DIALOG expressly disclaims any warranty or assurance that electronic files will remain accurate beyond date that files were created.
   • DIALOG 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 files and format provided, whether resulting from negligence, accident or any other cause."

Accepting this electronic disclaimer will allow the user to access the contents of the electronic file.

END OF SECTION
1 General

1.1 RELATED REQUIREMENTS

1.1.1 Section 01 31 13 – Project Coordination

1.1.2 Section 01 33 00 – Submittal Procedures

1.1.3 Section 01 33 50 – Delegated Design Submittals

1.1.4 Section 01 35 21 – LEED® General Requirements: LEED® information and submittals required by Owner, and LEED® closeout documentation.

1.1.5 Section 01 45 26.23 – Site Quality Control Procedures - Durable Building Quality Management Program: Scheduling requirements for constructability to achieve LEED® durable building credit.

1.1.6 Section 01 78 23 – Operations and Maintenance Data

1.1.7 Section 01 78 39 – Project Record Documents.

1.1.8 Section 01 78 43 – Spare Parts

1.1.9 Divisions 21, 22 and 23 – Common Work Results: Common work results for fire suppression, plumbing, and heating, ventilating and air conditioning systems

1.1.10 Division 25 – Common Work Results: Common work results for integrated automation.

1.1.11 Divisions 26, 27 and 28 – Common Work Results: Common work results for electrical, communications, and electronic safety and security.

2 Products

2.1 PROGRESS SCHEDULE

2.1.1 Trade Contractors shall submit a progress schedule for their portions of the Work to Construction Manager for review and comment; Construction Manager may request minor changes or clarifications to the progress schedule before finalizing for incorporation in the Project Progress Schedule.

2.1.2 Include intermediate dates for specific portions of Work to be completed for Owner's use and dates for receiving and installing any Owner purchased or supplied equipment.

2.1.3 Do not change Schedule without Consultant's written acceptance. If a change is necessary, submit written reasons for the change to Consultant for review and comment.

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

2.1.5 Sub-Schedules: Provide sub-schedules to define facility start-up and commissioning using same format as required for progress schedule, except in greater detail:

2.1.5.1 Form of Sub-Schedules: Same as Construction Progress Schedule required by Construction Manager.
2.1.5.2 Content of Facility Start-Up Sub-Schedules: List and provide a parent bar for the following:

2.1.5.2.1 Fire suppression systems specified in Division 21.
2.1.5.2.2 Plumbing systems specified in Division 22.
2.1.5.2.3 Heating, ventilation and air conditioning systems specified in Division 23.
2.1.5.2.4 Building automation systems specified in Division 25.
2.1.5.2.5 Electrical systems specified in Division 26.
2.1.5.2.6 Communications systems specified in Division 27.
2.1.5.2.7 Electronic safety and security systems specified in Division 28.

2.1.5.3 Include milestone dates for the completion of Construction Progress Schedule tasks that are linked to start dates for Facility Start-Up tasks.

2.1.5.4 Group Facility Start-Up tasks by system and provide a separate bar for one or more tasks within each of the following activities:

2.1.5.4.1 Pre-start tests and inspections.
2.1.5.4.2 Start-up procedures, including manufacturer’s site services where required.
2.1.5.4.3 Testing, adjusting and balancing.
2.1.5.4.4 Preparation of reports.
2.1.5.4.5 Consultant’s review of systems and reports.
2.1.5.4.6 Contract Deficiency correction.

2.1.5.5 Indicate start and completion dates for each activity.

2.1.5.6 Submissions: Submit Sub-Schedules together with Construction Progress Schedule.

2.1.6 Progress Revisions: Same as Construction Progress Schedule. Verify that Sub-Schedules remain coordinated with Construction Progress Schedule.

2.2 BREAKDOWN OF CONTRACT PRICE SCHEDULE

2.2.1 Provide a breakdown of Total Contract Price within time frame identified by Construction Manager.

2.2.2 Construction Manager will prepare a summary of Total Contract Price be in a form acceptable to the Owner showing Trade Contractor categories and include; as separate items, allowances (if applicable) and GST (payable on total amount).

2.3 SUBMITTALS SCHEDULE

2.3.1 Provide submittals schedule forming a part of the progress schedule indicating date of submission allowing for the following:

2.3.1.1 Consultant’s minimum time frame requirements listed in Section 01 33 00.
2.3.1.2 Allow for increased review time in discussion with Construction Manager where complex information is being combined or quantity of materials submitted can affect Consultant’s review.
2.3.1.3 Allow for re-submittal time where coordination is required
2.3.1.4 Indicate milestones as a part of progress schedule, except in greater detail.
2.3.2 Trade Contractor shall include a listing of required submittals identified in the technical specification sections affecting their portions of the Work within four (4) weeks after Contract award including the following:

2.3.2.1 Delegated Design Submittals:
2.3.2.2.1 Letters of Commitment
2.3.2.2.2 Letters of Compliance

2.3.2.3 Action Submittals:
2.3.2.3.1 Shop Drawings
2.3.2.3.2 Product Data
2.3.2.3.3 Samples

2.3.2.4 Information Submittals:
2.3.2.4.1 Qualification Statements
2.3.2.4.2 Personnel Certification
2.3.2.4.3 Design Notes
2.3.2.4.4 Certificates

2.3.2.5 Sustainable Submittals:
2.3.2.5.1 LEED® Submissions

2.3.2.6 Project Coordination Submittals
2.3.2.6.1 Agenda for Preconstruction Meetings
2.3.2.6.2 Scheduling

2.3.2.7 Quality Control Submittals:
2.3.2.7.1 Mock-Ups
2.3.2.7.2 Inspection and Testing
2.3.2.7.3 Source Quality Control Testing
2.3.2.7.4 Site Quality Control Testing

2.3.2.8 Project Closeout Submissions:
2.3.2.8.1 Project Record Documents
2.3.2.8.2 Spare Parts and Tools
2.3.2.8.3 Operation and Maintenance Information
2.3.2.8.4 Warranties and Guaranties

2.3.3 Indicate priority for review in Comments column for each item where multiple documents are submitted to Consultant for consecutive review:

2.3.3.1 Update schedule monthly and submit to Consultant as a part of Progress Claim.
2.3.3.2 Allow sufficient time for return of submittals to allow thorough review where multiple documents are submitted.
2.3.3.3 Consultant will endeavour to meet return date criteria, but reserves the right to request a time extension where submitted quantities do not permit a thorough review of documents.
2.3.4 Consultant will track all submissions using the Electronic Project Management Software Systems listed in Section 01 31 13.

3 Execution

3.1 NOT USED

END OF SECTION
1 General

1.1 RELATED REQUIREMENTS

1.1.1 Section 01 25 00 – Substitution Procedures: Proposals for products that differ from those specified as Basis-of-Design Materials or Acceptable Materials; submission of substitutions as a part of shop drawing, product data and sample submittals will not be accepted.

1.1.2 Section 01 26 13 – Requests for Information Procedures: Questions arising through the shop drawing and product data review process are not considered as RFI’s; shop drawings and product data will not be accepted if submitted in the form of an RFI.

1.1.3 Section 01 31 26 – Electronic Communications Protocol for BIM: Bilateral agreement for sharing and transfer of electronic drawing information between the building information model and Construction Manager submitted information using concepts of Integrated Project Delivery.

1.1.4 Section 01 32 00 – Schedules: Preparation of submittal schedule for shop drawings, product data and samples, and other submissions required for the project as a part of overall Project Schedule.

1.1.5 Section 01 33 50 – Delegated Design Submittals: Requirements for design solutions assigned to Trade Contractors for completion of fabrication specific detailing.

1.1.6 Section 01 35 20 – Site Safety Requirements: Submission of safety program and names of primary contacts responsible for site safety.

1.1.7 Section 01 35 31 – LEED® Special Project Requirements: Submission of product data relating to performance requirements to obtain LEED® certification level required for the Project.

1.2 DEFINITIONS

1.2.1 Action Submittals: Submittals indicating Construction Manager’s solutions for constructability and conformity with Consultant’s design intent, and that require review and acceptance by Consultant before starting any work.

1.2.2 Informational Submittals: Submittals necessary for coordination of the Work, for delegated design not performed by the Consultant or for proof of performance, and that do not require review and acceptance by the Consultant.

1.2.3 Sustainable Design Submittals: Submittals identifying product performance properties described in Specifications and that are required for LEED® recordkeeping; submitted concurrently with Action Submittals as described in Section 01 35 31.

1.3 ADMINISTRATION REQUIREMENTS

1.3.1 Submittal Processing Requirements: Coordinate preparation and processing of submittals with performance of construction activities:

1.3.1.1 Coordinate preparation of required submittals with Construction Manager and deliver in formats specified in this section and for products, systems or equipment as requested in various sections of Specifications.
1.3.1.2 Coordinate each submittal with fabrication, purchasing, testing, delivery, other submittals, and related activities that require sequential activity:

1.3.1.2.1 Individual submissions will not be reviewed until related information is available.
1.3.1.2.2 Prepare submissions sufficiently in advance of scheduled dates for installation to allow for review and comment by the Consultant.
1.3.1.2.3 Identify which submissions have a higher priority with respect to progress of Work when multiple submissions are made.

1.3.1.3 Coordinate transmittal of different types of submittals for related parts of Work so processing will not be delayed because of need to review submittals concurrently for coordination:

1.3.1.3.1 Consultant reserves the right to withhold action on a submittal requiring coordination with other submittals until related submittals are received.

1.3.2 Submittals Schedule: Provide a task line indicating projected submission milestones based on backdating from the time they are needed to coordinate the Work in accordance with requirements in Section 01 32 00, listing required submittals and time requirements for scheduled performance of related construction activities.

1.3.3 Submittal Processing Time: Allow enough time for submittal review, including time for re-submittals, as follows. Time for review shall commence on Consultant's receipt of submittal:

1.3.4 Submittal Processing Time: Allow enough time for submittal review, including time for re-submittals, as follows. Time for review shall commence on Consultant's receipt of submittal:

1.3.4.1 Consultant's stated response times listed below or other time proposed by Construction Manager or Trade Contractor does not represent a guaranty that submittals will be addressed within the stated time period:

1.3.4.1.1 Consultant will endeavor to respond within time frame stated, but will request additional response time where multiple submissions are received within a short period of time, or where coordination and complexity of submittals requires additional time.
1.3.4.1.2 Consultant will advise Construction Manager when submittals being processed must be delayed due to coordination, quantity of submittals or complexity of review components.
1.3.4.1.3 Construction Manager will advise Trade Contractor and will discuss methods for prioritizing critical submittals and establish a mutually acceptable response time.

1.3.4.2 Initial Review: Allow a minimum of ten (10) Working Days for initial review of each submittal. Allow additional time if processing must be delayed to permit coordination with subsequent submittals.
1.3.4.3 Concurrent Review: When concurrent review of submittals by Consultant's Subconsultants, Owner, or other parties is required, allow a minimum of fifteen (15) Working Days for initial review of each submittal. Direct transmittal to Consultant's Subconsultants will not be permitted.

1.3.4.4 If intermediate submittal is necessary, process it in same manner as initial submittal and allow for a minimum of five (5) additional Working Days for processing each re-submittal.

1.3.4.5 Incomplete or deficient submittals will be returned to Construction Manager marked Not Reviewed with a statement indicating reason for non-review.

1.3.4.6 No extension of Contract Time will be authorized because of failure to transmit submittals with enough advance notice to permit correct and accurate processing by the Consultant and orderly progression of the Work.

1.3.5 Submittal Transmittal Contents: Accompany submissions with transmittal letter, in duplicate, containing:

1.3.5.1 Submissions from Construction Manager:

1.3.5.1.1 Date and revision dates
1.3.5.1.2 Project title and number
1.3.5.1.3 Construction Manager's name and address
1.3.5.1.4 Identification and quantity of each shop drawing, product data and sample
1.3.5.1.5 Other pertinent data
1.3.5.1.6 Submittals may be rejected for not complying with these requirements

1.3.5.2 Submissions from Trade Contractor:

1.3.5.2.1 Date and revision dates
1.3.5.2.2 Project title and number
1.3.5.2.3 Name and address of:

- Trade Contractor
- Supplier
- Manufacturer

1.3.5.2.4 Construction Manager's stamp, signed by Construction Manager's authorized representative certifying approval of submissions, verification of site measurements and compliance with Contract Documents.

1.3.5.2.5 Details of appropriate portions of Work as applicable:

- Fabrication
- Layout, showing dimensions, including identified site dimensions, and clearances
- Setting or erection details
- Capacities
- Performance characteristics
- Standards
- Operating weight
- Wiring diagrams
- Single line and schematic diagrams
- Relationship to adjacent work
1.3.5.3 Distribution of Reviewed Submittals: Construction Manager shall distribute copies of final submittals to manufacturers, Trade Contractors, suppliers, fabricators, installers, authorities having jurisdiction, and others as necessary for performance of construction activities after Consultant's review. Show distribution on transmittal forms.

1.3.5.4 Use for Construction: Use only final submittals with mark indicating action taken by Consultant in connection with construction.

1.3.6 Electronic BIM Project Files Available from Consultant: Coordinate use of electronic BIM documents with Section 01 31 26.

1.4 SUBMITTALS

1.4.1 Electronic Submittals: Submit shop drawings, product data, design criteria, delegated design documentation, LEED® documentation and other documents required by the specifications electronically using open source Portable Document Format (PDF) software that is compatible with ISO 32000-1:2008 Document Management:

1.4.1.1 Software Writers: Any software that can save to or write a PDF including that allows for encryption and signature.

1.4.1.2 Scanned Copies: Legible scanned PDF files of paper originals are acceptable; scanned submittals that are not legible will be rejected.

1.4.1.3 File Size: Maximum file sizes for delivery of PDF submittals are as follows:

1.4.1.3.1 E-Mail Delivery: 5 Megabytes (MB)
1.4.1.3.2 FTP Site Delivery: 100 MB
1.4.1.3.3 Split Delivery: Break larger PDF files into small packages where necessary to meet delivery restrictions; identify split packages as “1 of 2” and “2 of 2” in the Subject Line of submission after other required information listed below.

1.4.1.4 Sheet Orientation: Assemble PDF sheets in a single file; unless resulting file is larger than 10 MB, rotated to a “Ready-to-Read” orientation with majority of text horizontal to the sheet with no additional adjustments or formatting required by the viewer.

1.4.1.5 File Security: Do not set any permissions on the file; protected documents will not be accepted.

1.4.1.5 File Identification: File name must contain Project Number, Name of Submission, Date of Submission, Name of Fabricator and Submittal Number with underscore between each item; do not use periods except immediately prior to document type; example file name follows:

```
F01000-02000_Misc Steel SD_2012-01-31_ABC Steel Fab_001.pdf
```

<table>
<thead>
<tr>
<th>Submission Date YYYY-MM-DD</th>
<th>File Extension</th>
</tr>
</thead>
<tbody>
<tr>
<td>F01000-02000_Misc Steel SD_2012-01-31_ABC Steel Fab_001.pdf</td>
<td>Project Number</td>
</tr>
</tbody>
</table>
1.4.1.6 Transmission Requirements: Send non-zipped files as an attachment to e-mail or upload to FTP site; zipped files will be rejected:

1.4.1.6.1 E-Mail Transmission: Include same name as the attachment file name without the file type extension in the Subject Line; e-mail that does not contain appropriate subject will be rejected.

1.4.1.6.2 FTP Transmission: Notify Consultant using e-mail that documents have been uploaded; use same subject line protocol as noted above.

1.4.1.6.3 Transmittal Layout: Include only one attachment or one topic per e-mail transmission, with the following text appearing in the body of the transmission; <> indicates text edited by sender:

- Attention: <Project Manager>
- Project Number 03550C01
- Project Name: New Central Library
- Name of Construction Manager: Stuart Olson
- Name of Trade Contractor: <Insert Name>
- Name of Fabricator: <Insert Name>
- Name of Product or Assembly: <Insert Name>
- Submission Method: <e-mail> <FTP site>

Attached is one set of <Shop Drawings> <Product Data> <Insert Name of Other Document> relating to the above mentioned project, product or assembly.

Attachments are for your review, comments and acceptance prior to starting fabrication of the items listed.

Please return reviewed documents to:

- Name of Construction Manager: <Insert Name>
- Name and e-mail address of Primary Recipient: <Insert Name> and <e-mail address>

1.4.2 Hard Copy Submittals: Submit shop drawings, product data, design criteria, delegated design documentation, LEED® documentation and other documents required by the specifications as follows:

1.4.2.1 Size: Submit paper documents ranging in size as follows:

1.4.2.1.1 Minimum Sheet Size: 215 mm x 280 mm
1.4.2.1.2 Maximum Sheet Size: 750 mm x 1000 mm

1.4.2.2 Quantity:

1.4.2.2.1 Drawings up to 280 mm x 430 mm: Submit one (1) photo reproducible copy.
1.4.2.2.2 Drawings larger than 280 mm x 430 mm: Submit one (1) photo reproducible copy.
1.4.2.2.3 Prepare drawings containing full size templates or patterns on sheets of sufficient size to convey required information.

1.4.2.3 Consultant will make as many copies as they require and return original to Construction Manager.
1.4.2.4 Construction Manager will retain original for inclusion in first copy of Operations and Maintenance Manual, and reproduce as many sets of shop drawings as required for inclusion in Operations and Maintenance Manuals, as required for their own use and one additional copy for use of Trade Contractor.

1.4.2.5 Trade Contractor may make as many copies as required for their own use.

1.4.2.6 Consultant will destroy any additional copies sent by Construction Manager in excess of the number requested.

2 Products

2.1 PURCHASE ORDERS

2.1.1 Submit copies of purchase orders for time sensitive or long lead time materials; order time sensitive materials and equipment in sufficient time to allow installation within Work:

2.1.1.1 Requests for substitute materials will not be considered by Consultant where specified product has not been ordered in proper advance time considering place of origin of product, normal method of delivery and manufacturers ordering requirement.

2.1.1.2 Trade Contractor will make alternate arrangements including; but not limited to, expedited delivery, custom fabrication or accelerating fabrication schedules to meet project schedule where sufficient time was not allowed for delivery of materials or equipment.

2.1.2 Copy of purchase order shall indicate date of order and expected date of delivery; pricing information and discounting structures may be deleted from copy of submitted purchase orders.

2.2 SHOP DRAWINGS

2.2.1 Shop Drawings: Original copies of drawings drawn accurately to scale, modified standard drawings provided by manufacturers, or modified standard drawings provided by Trade Contractor to illustrate details of portions of Work, that are specific to project requirements:

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

2.2.1.2 Include the following information on Shop Drawings, as applicable:

2.2.1.2.1 Information cross referenced to applicable portions of Contract Documents
2.2.1.2.2 Include dimensions consistent with units shown on drawings; converted values are acceptable when items or information are not produced in indicated units
2.2.1.2.3 Identification of products
2.2.1.2.4 Fabrication and installation drawings
2.2.1.2.5 Roughing-in and setting diagrams
2.2.1.2.6 Wiring diagrams showing site installed wiring, including power, signal, and control wiring
2.2.1.2.7 Shop work manufacturing instructions
2.2.1.2.8 Templates and patterns
2.2.1.2.9 Schedules
2.2.1.2.10 Design calculations
2.2.1.2.11 Compliance with specified standards
2.2.1.2.12 Notation of coordination requirements by specific related Trade Contractors; the term "By Others" will not be acceptable

2.2.1.2.13 Notation of critical dimensions established by site measurement, or that have to be maintained to fit components

2.2.2 Shop Drawing Review Stamps: Format shop drawings so that there is sufficient space for Construction Manager’s, and Consultant's circulation stamps to appear on face of submittal:

2.2.2.1 Attach a separate cover sheet with a full description of shop drawing contents when there is not sufficient space for circulation stamps.

2.2.2.2 Consultant will reject drawings not stamped, reviewed and signed by Construction Manager.

2.2.3 Delegated Design, Design Criteria and Notes: Submit design criteria and notes where design has been delegated to Trade Contractor as a part of shop drawing submittals and provide information necessary to determine compliance with design intent:

2.2.3.1 Submit shop drawings only where specified.

2.2.3.2 Request advance permission from Consultant to submit shop drawings when not specified for materials, products or systems, for Consultant's review.

2.2.3.3 Delegated Design engineer must be registered in province where project is located and have expertise in area of practice reflected in shop drawings when specifications require shop drawings to bear seal of professional engineer.

2.3 SAMPLES

2.3.1 Submit samples for materials, assemblies or equipment as examples of quality, finishes or workmanship in quantities indicated and when requested by the technical specification Sections; additional samples will be considered where performance or appearance of the work is considered a critical requirement by the Trade Contractor where samples are not specifically required.

2.3.2 Submit full range or multiple samples when variations in colour, pattern or texture is a natural occurrence of the materials being considered for use for the Work; reviewed and accepted samples will become standard of workmanship and material against which installed work will be verified.

2.3.3 Identify samples with name and number of project, date, name of Construction Manager, name of Trade Contractor, name of supplier/manufacturer and intended use of material represented by Sample.

2.3.4 Do not proceed with fabrication or delivery of materials until Samples are reviewed; review of Samples does not imply acceptance of finished Work.

2.3.5 Work judged by Consultant as being below the standard set by sample may be rejected; in which event, Trade Contractor will replace with acceptable Work, at no additional cost to Owner and no extension of time.
2.4 PRODUCT DATA

2.4.1 Submit copies of product data sheets; such as, manufacturers’ catalogue sheets, brochures, literature, performance charts and diagrams, and similar literature used to illustrate standard manufactured products, modified as follows:

2.4.1.1 Delete information not applicable to project
2.4.1.2 Supplement standard information to provide details applicable to project
2.4.1.3 Cross reference product data information to applicable portions of Contract Documents

2.5 SAFETY PROGRAM

2.5.1 Submit proof that Construction Manager has developed and are involved with a viable Safety Program; Owner will use safety program as performance measurement standard for the Work; coordinate requirements and notify Owner of project safety meetings in accordance with Section 01 35 20.

3 Execution

3.1 DELEGATED DESIGN ENGINEER’S RESPONSIBILITIES

3.1.1 Trade Contractor’s shall provide registered professional engineering services for all Sections of the Work requiring Delegated Design and Shop Drawings requiring a professional engineer’s seal.

3.1.2 Registered professional engineer shall sign and seal all shop drawings and supporting documentation and stamp shop drawings with permit to practice for the province of Alberta.

3.1.3 Registered professional engineer is responsible for review of all fabrication and installation of such components designed by them in accordance with Section 01 33 50.

3.1.4 Registered professional engineer shall provide the Consultant with Letter of Compliance in accordance with Section 01 33 50 confirming that work design by them is in conformance with shop drawings, code requirements and contract documents at completion of the Work.

3.1.5 Refer to Section 01 33 50 and specific Sections for detailed requirements.

3.2 CONSTRUCTION MANAGER’S REVIEW

3.2.1 Review each submittal and check for compliance with Contract Documents. Note corrections and site dimensions. Mark with approval stamp before submitting to Consultant.

3.2.2 Approval Stamp: Stamp each submittal with a uniform approval stamp. Include Project name and location, submittal number, Specification Section title and number, name of reviewer, date of Construction Manager’s approval, and statement certifying that submittal has been reviewed, checked, and reviewed for compliance with Contract Documents.

3.2.3 Consultant will not review submittals that contain the following deficiencies or errors and will return them to the Construction Manager without further action:

3.2.3.1 Submittals that do not bare Construction Manager’s approval stamp.
3.2.3.2 Submittals that are forwarded directly from a Trade Contractor or supplier.
3.2.3.3 Submittals that appear not to have been initially reviewed by the Construction Manager.

3.2.3.4 Submittals that form a part of a Request for Information, that contain obvious errors or omissions, or that contain unsolicited substitutions that have not been previously accepted by Consultant.

3.2.3.5 Unsolicited submittals not identified as required by the Specifications, unless specifically identified to Consultant by Construction Manager as a proposed submission that aids in the sequence or constructability of the Work.

3.2.4 Trade Contractor shall provide Consultant with written notification of deviations of any type from those indicated in the Contract Documents; Consultant will not accept any liability for deviations that are not identified by the Trade Contractor; Trade Contractor will remain liable for any deviations unless specifically reviewed and acknowledged in writing by the Consultant.

3.3 CONSULTANT’S REVIEW

3.3.1 Consultant will not review submittals concerning Construction Manager’s implementation of means, methods, procedures, sequences or techniques, or other temporary aspects of the construction process that would normally form a part of the responsibility assigned under Contract to the Trade Contractor.

3.3.2 Any submittals received from the Construction Manager that were not specifically requested in the Specifications will be immediately returned to the Construction Manager and stamped “Not Required for Review”.

3.3.3 Consultant will review or take other appropriate action on the submittals, such as shop drawings, product data, samples and other data, which the Construction Manager is required to submit, but only for the limited purpose of checking for conformance with the design concept and the information shown in the Contract Documents:

3.3.3.1 This review will not include review of the accuracy or completeness of details, such as quantities, dimensions, weights or gauges, fabrication processes, construction means or methods, coordination of the work with other trades or construction safety precautions, all of which are the sole responsibility of the Construction Manager.

3.3.3.2 Consultant’s review will be conducted with reasonable promptness while allowing sufficient time in the Consultant’s judgment to permit adequate review.

3.3.3.3 Review of a specific item shall not indicate that the Consultant has reviewed the entire assembly of which the item is a component.

3.3.3.4 Consultant will not be responsible for any deviations from the Contract Documents not brought to the attention of the Consultant in writing by the Construction Manager.

3.3.3.5 Consultant will not be required to review partial submissions or those for which submissions of correlated items have not been received.

3.3.4 Consultant will review each submittal, make marks to indicate corrections or modifications required, and return it; Consultant will stamp each submittal with a Review Stamp and will mark the stamp appropriately to indicate action taken, as follows:

3.3.4.1 Is in General Conformance with design as noted:

3.3.4.1.1 Consultant may include additional notes or comments that do not affect the submittal review process.
3.3.4.1.2 Work affected by submittal can proceed without resubmission.

3.3.4.2 Revise and Resubmit as Noted:

3.3.4.2.1 Consultant notes that modifications to reviewed submittals are significant in nature and requests changes to submittals before starting work affected by submittals.

3.3.4.2.2 Consultant may permit proceeding with work when Construction Manager identifies that a significant delay in the work will occur resulting from the resubmittal process.

3.3.4.2.3 Construction Manager will be required to provide assurance that modifications are made to submissions during construction, and that resubmission occurs during the course of the work.

3.3.4.3 Rejected:

3.3.4.3.1 Submittals do not meet the intent of the design and indicate work that is not acceptable for the Project.

3.3.4.3.2 Consultant will not permit proceeding with work affected by rejected submittals until submittals are revised and resubmitted with information pertinent to the Project.

3.3.5 Consultant will stamp and forward submittals requiring concurrent review by their Subconsultants with a Date Stamp:

3.3.5.1 Subconsultant will apply their own version of Review Stamp, having similar parameters as Consultant’s action stamp and return to Consultant.

3.3.5.2 Consultant will return stamped submittals to Construction Manager.

3.3.6 Electronically submitted documents will have an encrypted signature attached; indicating reviewer and location of PDF documents on Consultants server.

END OF SECTION
1 General

1.1 INTENT

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

1.1.1.1 Design requiring structural analysis of load bearing components and connections.
1.1.1.2 Design requiring compliance with fire safety regulations.
1.1.1.3 Design requiring compliance with life or health safety regulations.

1.1.2 This section provides standard forms for submittal of Letters of Commitment and Compliance required complying with requirements of Building Code and design delegated to a professional Engineer within technical specification sections.

1.1.3 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 Construction Manager’s or responsible Trade Contractor’s scope of Work.

1.1.4 The requirements of this section are in general conformance with recommended Responsibilities for Engineering Services for Building Projects published by Association of Professionals in Engineering and Geoscience in Alberta (APEGA), with regards to duties of specialty professionals appointed during construction period.

1.1.5 The requirements of this section do not diminish responsibilities of Consultant’s role as Registered Professional of Record; submittals will be used by Consultant to establish that Work is substantially performed in accordance with Building Code.

1.2 RELATED REQUIREMENTS

1.2.1 Section 01 33 00 – Submittal Procedures: Submission of Letters of Commitment prior to starting work affected by Delegated Design.

1.2.2 Section 01 41 00 – Reference Standards: Requirements for governing Building Codes and Standards.

1.2.3 Section 01 45 00 – Quality Control: Quality control and assurance responsibilities for design of shop and site fabricated components.

1.2.4 Section 01 78 39 – Project Record Documents: Submission of Letters of Compliance after completion of work affected by Delegated Design

1.2.5 Technical specification sections from individual Tender Packages make specific reference to delegated design requirements described in this Section.
1.3 DEFINITIONS

1.3.1 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 Project; who is registered in the province of the Work; and who is not the Consultant.

1.3.2 Letters of Commitment and Compliance: Documents prepared by the delegated design professional engineer as recommended by APEGA's Responsibilities for Engineering Services for Building Projects.

1.4 REFERENCE STANDARDS

1.4.1 Association of Professionals in Engineering and Geoscience in Alberta (APEGA):

1.4.1.1 APEGA Responsibilities for Engineering Services for Building Projects

1.5 SUBMITTALS

1.5.1 Provide required information in accordance with Section 01 33 00.

1.5.2 Informational Submittals: Provide the following submittals during the course of the Work:

1.5.2.1 Letter of Commitment: Submit a signed and sealed Letter of Commitment on company letterhead addressed to Consultant in accordance with format in Appendix A attached to the end of this Section prior to starting Work requiring design and seal of a professional engineer.

1.6 PROJECT CLOSEOUT SUBMISSIONS

1.6.1 Record Documentation: Submit the following required information in accordance with Section 01 78 39 before application for Substantial Performance:

1.6.1.1 Letter of Compliance: Submit a signed and sealed Letter of Compliance on company letterhead addressed to Consultant in accordance with format in Appendix B attached to the end of this Section on completion of Work requiring design and seal of a professional engineer.

2 Products

2.1 DELEGATED DESIGN

2.1.1 Performance and Design Criteria: Provide products and systems complying with specific performance and design criteria indicated where professional design services or certifications by a design professional are specifically required of Trade Contractor by Contract Documents.

2.1.1.1 Requirements listed for Trade Contractor apply to Construction Manager where Delegated Design requirements are required for self performed components of the Work.

2.1.2 Submit a written request for additional information to Consultant and Trade Contractor if criteria indicated within documents are not sufficient to perform services or certification required.
2.1.3 Delegated design will be required for elements designed by a specialty professional, which may include:

2.1.3.1 Elements normally fabricated off-site
2.1.3.2 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).
2.1.3.3 Elements requiring civil engineering, not normally a part of scope of services performed by architectural; structural; mechanical; electrical; or geotechnical disciplines of Consultant (for example: structural steel connection design, steel deck design).

3 Execution

3.1 IMPLEMENTATION

3.1.1 Include Summary of Work described in technical specification section as a part of the required Letter of Commitment.

3.1.2 Prepare required submittals and present to Consultant within sufficient time to allow for Consultant’s detailed review and acceptance.

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APPENDIX A

LETTER OF COMMITMENT

Submit a signed and sealed Letter of Commitment on company letterhead in the form as follows:

[Date]

DIALOG™
[Consultant’s Address]

Attention: [Consultant’s Registered Professional of Record]

Re: Letter of Commitment for Delegated Design of [System of Component of Work]

[Name of Project]
[Project Number]
[City, Province]

As the retained registered professional engineer for design and field review of the above named component of Work and project, I hereby give assurance I am qualified to perform the following Work as required by Contract Documents:

1. [List appropriate design services for System or Component of Work];
2. Preparation of shop and erection documents;
3. Review fabrication of [structural] [fire rated] [life and health safety] components;
4. Review erection of [structural] [fire rated] [life and health safety] components.
5. [Modify list to suit System of Component of Work.]

I hereby give assurance that I will be responsible for above noted Work as described in Section [??????] – [Name of Section] of Project Manual, including requirements of addenda, change orders and change directives.

I also undertake to be responsible for field review of fabrication and erection of [structural] [fire rated] [life and health safety] components as required to ascertain substantial compliance with the Building Code and Contract Documents.

I will notify you in writing if my responsibility is terminated at any time during the course of Work covered by this Letter of Commitment.

Retained Professional Engineer

Signature

Date
(Apply seal)
LETTER OF COMPLIANCE

[Date]

DIALOG™
[Consultant’s Address]

Attention: [Consultant’s Registered Professional of Record]

Re: Letter of Compliance for Delegated Design of [System of Component of Work]

[Name of Project]
[Project Number]
[City, Province]

I hereby give assurance that I have fulfilled my obligations for field review as outlined by previously submitted Letter of Commitment.

I hereby give assurance that aspects of [structural] [life and health safety] Work as defined by previously submitted Letter of Compliance substantially comply with Contract Documents and Building Code.

Retained Professional Engineer

Signature

Date
(Apply seal)

END OF SECTION
1 General

1.1 RELATED REQUIREMENTS

1.1.1 Section 01 33 00 – Submittal Procedures

1.1.2 Section 01 75 16 – Startup Procedures: Facility start-up procedures.

1.1.3 Section 01 77 00 – Closeout Procedures: Contract acceptance requirements.

1.1.4 Divisions 21, 22 and 23 – Common Work Results: Common work results for fire suppression, plumbing, and heating, ventilating and air conditioning systems.

1.1.5 Division 25 – Common Work Results: Common work results for integrated automation.

1.1.6 Divisions 26, 27 and 28 – Common Work Results: Common work results for electrical, communications, and electronic safety and security.

1.2 SUBMITTALS

1.2.1 Provide required information in accordance with Section 01 33 00.

1.2.2 Submit draft of project specific Facility Start-Up Checklists for Commissioning Agency’s review and comment within two (2) weeks after date of commencement of Contract:

1.2.2.1 Obtain draft Facility Start-Up Checklists from Commissioning Agency.

1.2.2.2 Draft Facility Start-Up Checklists shall be complete with blank manufacturer's equipment start-up forms, test certificates and balancing reports.

1.2.3 Submit final Facility Start-Up Checklists to Commissioning Agency not later than six (6) weeks after receipt of Commissioning Agency's review and comments on draft submission.

1.2.4 Submit Facility Start-Up Checklists, complete with all data entered, prior to Interim Acceptance of the Work.

2 Products

2.1 FACILITY START-UP REPORT

2.1.1 Provide Facility Start-Up Checklists for the following:

2.1.1.1 Architectural finishes

2.1.1.2 Electronic hardware and tie-ins to building alarm systems

2.1.1.3 Elevator systems

2.1.1.4 Each mechanical system

2.1.1.5 Each automated system

2.1.1.6 Each electrical system

2.1.2 Include Manufacturer's equipment start-up reports, test certificates, and balancing reports as an appendix to Facility Start-Up report.

2.1.3 Provide an index of start-up report content and a sub-index for each system category. Include divider tabs for each system category and sub-tabs for each individual system. Similarly provide an index and divider tabs to organize report's appendix.
2.1.4 Preface each system in report with:

2.1.4.1 A list of equipment that makes up system.
2.1.4.2 Adjacent to list of equipment, include columns to indicate status of equipment operation, to date and to sign off equipment start-up.
2.1.4.3 Space to record equipment and operational problems which cannot be corrected within scheduled Facility Start-Up program, and which may delay Interim Acceptance of Work.

3 Execution

3.1 FACILITY START-UP CHECKLISTS

3.1.1 Include Manufacturer’s equipment start-up reports, test certificates and balancing reports as an appendix to the Facility Start-Up Checklists.

3.1.2 Combine Facility Start-Up Checklists and manufacturer’s equipment start-up reports and test certificates into an overall Facility Start-Up Report:

3.1.2.1 Provide an index of the start-up report content and a sub-index for each system category.
3.1.2.2 Include divider tabs for each system category and sub-tabs for each individual system.
3.1.2.3 Similarly provide an index and divider tabs to organize the report’s appendix.
3.1.2.4 Preface each system in the report with:

3.1.2.4.1 A list of equipment that makes up the system.
3.1.2.4.2 Adjacent to the list of equipment, include columns to indicate status of equipment operation, to date and to sign off equipment start-up.
3.1.2.4.3 Space to record equipment and operational problems which cannot be corrected within the scheduled Facility Start-Up program, and which may delay Interim Acceptance of the Work.

END OF SECTION
1 General

1.1 RELATED REQUIREMENTS

1.1.1 Section 01 31 19 – Project Meetings: Start-Up meeting, and ongoing safety meetings tied into regular job meetings.

1.1.2 Section 01 33 00 – Submittal Procedures: Safety Plan, MSDS’s and other information required by this section.

1.1.3 Requirements of this section apply with equal weight to all sections of the Project Manual.

1.2 ADMINISTRATIVE REQUIREMENTS

1.2.1 Owner’s Representative: Owner will provide a list of their safety personnel to the Construction Manager at the Start-Up Meeting.

1.2.2 Responsibility for Work Site Safety - This Construction Manager is "Prime Contractor":

1.2.2.1 The Construction Manager will, for the purposes of the Occupational Health and Safety Act (Alberta), and for the duration of the Work of this Contract:

1.2.2.1.1 Be the "Prime Contractor" for the "Work Site", and
1.2.2.1.2 Meet all requirements of the Occupational Health and Safety Act and Regulations, Workers Compensation Board legislation, the Fire Code legislation and all other applicable laws that govern work place safety.

1.2.2.2 The Construction Manager will direct all Trade Contractors, sub-Trade Contractors, Other Contractors, employees, suppliers, workers and any other persons at the “Work Site” on safety related matters, to the extent required to fulfill its “Prime Contractor” responsibilities pursuant to the Act, regardless of:

1.2.2.3 Whether or not any contractual relationship exists between the Construction Manager and any of these entities, and
1.2.2.4 Whether or not such entities have been specifically identified in this Contract.

1.2.3 Safety Certification: Safety certification is a condition of contract award; Trade Contractors are required to maintain a valid Certificate of Recognition (COR) for the duration of the Work of this Contract; Construction Manager will coordinate COR requirements with Trade Contractors affected by the provincial regulation.

1.3 SUBMITTALS

1.3.1 Provide required information in accordance with Section 01 33 00.

1.3.2 Informational Submittals: Provide the following submittals during the course of the work:

1.3.2.1 Provide Material Safety and Data Sheets (MSDS’s) for all controlled products as listed in the provincial Chemical Hazards Regulation.
1.3.2.2 Workers Compensation Board Experience Rating
1.3.2.3 Construction Manager’s Injury Severity and Frequency Report
1.3.2.4 Construction Manager's Safety Plan: Submit Construction Manager's Safety Plan, customized for use on this project to incorporate the following:

1.3.2.4.1 Permits required by the authorities having jurisdiction,
1.3.2.4.2 Emergency plans and contact name and telephone list,
1.3.2.4.3 Copy of Construction Manager's liability insurance policy,
1.3.2.4.4 Safety procedures for electrical systems, including but not limited to, de-energization and re-energization, Alberta 1ST Call, locking out and tagging of systems, identification of energized lines, and requirements of local utilities,
1.3.2.4.5 Safety procedures for mechanical systems, including but not limited to, isolation and depressurization of pressure systems, locking out and tagging of systems, purging of systems, and restart and refill of systems,
1.3.2.4.6 Ventilation procedures for confined spaces and MSDS work requirements,
1.3.2.4.7 Minutes from Start-Up Meeting and Safety Meetings,
1.3.2.4.8 List of Personal Protection Equipment (PPE) required on site,
1.3.2.4.9 Noise control procedures,
1.3.2.4.10 Work place incident and severity reports for this Project,

1.3.2.5 The Owner will review Construction Manager's Safety Plan and may request modifications or additions as necessary for the work of this Contract.

1.3.2.6 Construction Manager's Safety Plan shall be kept on site and updated after each Safety Meeting.

1.4 SITE CONDITIONS

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

2 Products

2.1 NOT USED

3 Execution

3.1 SAFETY REQUIREMENTS

3.1.1 Construction Manager will verify that emergency procedures including appropriate First Aid facilities and First Aid personnel are in place at the Work Site.

3.1.2 Construction Manager will employ an on-site Construction Safety Officer (CSO) who is responsible for the following:

3.1.2.1 Providing new employee orientation
3.1.2.2 Overseeing site activities
3.1.2.3 Providing appropriate training on personal protective equipment and Workplace Hazardous Materials Information System (WHMIS)
3.1.2.4 Conducting and documenting accident investigations as required
3.1.2.5 Conducting daily work site inspections
3.1.2.6 Conducting weekly site safety meetings, train new employees and verifying that Trade Contractors, sub-Trade Contractors, suppliers and others working on the site are aware of safety requirements.

3.1.2.7 CSO shall be certified by a training program recognized by the Alberta Construction Safety Association.

3.1.3 Maintain on site sufficient quantities of PPE, including but not limited to: hard hats, safety glasses, hearing protection and other items of clothing or special equipment as necessary to verify that visitors to the site, the Consultant and the Owner’s representative are adequately protected.

3.1.4 Verify that all Trade Contractors, sub-Trade Contractors, suppliers and others working on the site, meet clothing requirements of shirts with sleeves no shorter than midway between shoulder and elbow and full length pants; muscle shirts or sleeveless shirts, cut-offs or shorts will not be allowed on the work site.

END OF SECTION
1 General

1.1 SUMMARY

1.1.1 This Section includes general requirements and procedures for compliance with Canada Green Building Council’s (CaGBC) prerequisites and credits needed for Project to obtain Leadership in Energy and Environmental Design (LEED®) Gold level of certification for new Construction 2009:

1.1.1.1 This section contains requirements that are applicable to the entire project, and that form a part of the administration process.
1.1.1.2 Prerequisites and credits needed to obtain the specified certification level are dependent on material selections that are noted in technical specifications.
1.1.1.3 Compliance with requirements needed to obtain prerequisites and credits will be used as one criterion to evaluate requests for substitution in Section 01 62 00 – Product options – Substitutions Procedures.

1.1.2 No single manufacturer, supplier, fabricator or Trade Contractor can fulfill total requirements for project certification:

1.1.2.1 Consultant will assemble information submitted during the course of the Work and prepare the required letters, spreadsheets and other supporting documentation for submitting to CaGBC
1.1.2.2 Certification requires cooperation and diligence of project participants for the successful application, acceptance and completion of requirements specified in this Section.

1.1.3 Failure to provide products, methods of construction or associated supporting documentation contributing towards prerequisites and credits will result in Owner achieving a certification level less than that specified, or no Certification at all; Owner will reserve the right to seek compensation where failure to achieve Certification is a result of direct neglect or misrepresentation of any material or construction method.

1.2 RELATED REQUIREMENTS

1.2.1 Specifications requirements applicable to the work of each Section that affects Construction Manager and related Trade Contractor submissions required for the Project.

1.2.2 Section 01 62 00 – Product options: Submission requirements for LEED® compliant products and materials, not otherwise listed in the Specifications.

1.2.3 Section 01 45 16.16 – Site Quality Control Procedures: Construction Activity Pollution Prevention

1.2.4 Section 01 45 16.19 – Site Quality Control Procedures: Waste Management during Construction

1.2.5 Section 01 45 16.23 – Site Quality Control Procedures: Indoor Air Quality (IAQ) Management during Construction.

1.2.6 Section 01 45 16.26 – Site Quality Control Procedures: Durable Building Quality Management Program: Coordinating requirements for quality assurance testing and corrections required to verify durable building construction.
1.2.7 Section 25 06 91 – Measurement and Verification: Providing information required for ongoing measurement of mechanical systems performance and verification of building energy consumption by the Owner for a minimum of one (1) year after post-construction occupancy.

1.3 REFERENCE STANDARDS

1.3.1 Canada Green Building Council (CaGBC):
   1.3.1.1 Leadership in Energy and Environmental Design (LEED®) for New Construction 2009

1.3.2 Canadian Standards Association (CSA):
   1.3.2.1 CAN/CSA ISO 14021-00 (R2009), Environmental Labels and Declarations - Self-Declared Environmental Claims

1.3.3 Federal Trade Commission (FTC):
   1.3.3.1 16 CFR, Part 260, Guidelines for the Use of Environmental Marketing Claims

1.4 ADMINISTRATIVE REQUIREMENTS

1.4.1 LEED® Familiarity Meetings: Schedule regular meetings in accordance with Section 01 31 19 – Project Meetings with Construction Manager, Consultant and affected Trade Contractor’s in attendance before starting any work affected by submission requirements:
   1.4.1.1 Education may require additional diligence towards the end of a project due to the increased number of personnel on site who may not be familiar with sustainable design and submission requirements necessary to reduce the potential for credits being lost in the drive towards project completion.

1.4.2 LEED® Coordination Meetings: Schedule regular meetings in conjunction with Construction Progress Meetings to review progress of submission of Material Information Sheets and other onsite activities affecting work of this Section accordance with Section 01 31 19 – Project Meetings:
   1.4.2.1 Requirements for agenda, meeting attendees, recording of minutes are specified in Section 01 31 19
   1.4.2.2 Requirements of this Section must be reinforced at each required regularly scheduled site meeting, similarly to safety requirements.

1.5 SUBMITTALS

1.5.1 Provide requested information in accordance with Section 01 33 00 – Submittal Procedures; coordinate submission of additional requirements included in technical Sections of Project Manual.
1.5.2 Action Submittals: Construction Manager is required to provide the following submittals before starting any work of this Project:

1.5.2.1 Material Information Sheets: Provide submissions using Consultant’s standardized Material Information Sheets attached to the end of this Section and as follows:

1.5.2.1.1 Include all information submissions required to identify products contained in a complete assembly.

1.5.2.1.2 Include required information to coincide with other submissions required by technical specifications.

1.5.2.1.3 Include required information before ordering materials and transporting to project site as a part of submissions review process indicated in Section 01 33 00.

1.5.2.2 Total Construction Cost Data: Provide statement indicating total construction cost for building materials used for Project as follows:

1.5.2.2.1 Include Total Construction Costs (materials, equipment and labour) for Divisions 02 to 10, and Divisions 31 and 32.

1.5.2.2.2 Costs for Divisions 11 to 14, Mechanical Divisions 20 to 25, Electrical Divisions 26 to 28, Utilities and Transportation Divisions 33 to 36 and Process Divisions 40 to 48 are specifically excluded from the Total Construction Cost Data.

1.5.2.2.3 Update Total Construction Cost Data resulting from changes to the Work during the course of construction.

1.5.2.3 Construction Activity Pollution Prevention – Sustainable Sites Prerequisite 1: Submit proposed erosion and sediment control plan meeting requirements of 2003 US EPA Construction General Permit or local standards and codes; whichever is more stringent, indicating measures installed on site to prevent loss of soil from site, sedimentation entering storm sewers or natural water courses, and airborne dust control as required by Section 01 45 16.16.

1.5.2.4 Construction Waste Management – Materials and Resources Credit 2: Submit proposed waste management plan required by Section 01 45 16.19 indicating potential for diversion of construction waste materials from landfill during construction, and methods of recording percentage of materials that are recycled or salvaged.

1.5.2.5 Construction IAQ Management Plan – Indoor Environmental Quality Credit: Submit proposed indoor air quality management plan required by Section 01 45 16.23 indicating measures used on site to maintain prevent indoor air problems resulting from construction including requirements for control of Volatile Organic Compounds (VOC’s) within the building envelope, moisture control materials and measures, and installation of temporary filtration media on permanently installed air handlers used during construction:

1.5.2.6 Low Emitting Materials: Submit VOC Budget and Material Safety and Data Sheets (MSDS), and similar information sheets indicating VOC content in grams/litre (g/L) for all materials having the potential to emit noxious, toxic or volatile compounds to the interior side of the building envelope the following:

1.5.2.6.1 Concrete form release agents, coatings and sealers
1.5.2.6.2 Adhesives
1.5.2.6.3 Primers
1.5.2.6.4 Floor and wall patching and levelling materials
1.5.2.6.5 Caulking and sealants
1.5.2.6.6 Insulating materials
1.5.2.6.7 Fireproofing and firestopping
1.5.2.6.8 Carpet
1.5.2.6.9 Paints and coatings
1.5.2.6.10 Lubricants
1.5.2.6.11 Cleaning Products
1.5.2.6.12 Composite wood products
1.5.2.6.13 Any additional materials having the potential to emit VOC’s affecting indoor air quality during construction and occupancy

1.5.2.7 Durable Building – Regional Priority Credit 1: Provide quality control plan to verify constructability and for correcting deficiencies during the course of construction as required by Section 01 45 16.26:

1.5.2.7.1 Consultant will provide a LEED® Letter Template to the Construction Manager; which must be signed by the Construction Manager, declaring that they have been developed and implemented a program to manage corrective actions for materials affecting content of RPc1.

2 Products

2.1 MATERIALS

2.1.1 Specific requirements for submittals and material performance are indicated in Technical Specification Sections within the remainder of the Project Manual; Credits listed in this Section are required for the project.

2.1.2 Notwithstanding the fact that the Technical Specification Sections indicate the requirements for specified products, any materials that contain Volatile Organic Compounds (VOC’s) covered by the Indoor Environmental Quality Credits 4.1, 4.2, 4.3 and 4.4 will be read as a mandatory requirement for the project:

2.1.2.1 This requirement applies to all products installed to the interior side of the building envelope whether or not specifically identified in any technical specification.

2.1.2.2 This requirement applies to all construction disciplines contributing materials including structural, architectural, interior design, mechanical, electrical and any other specialty equipment or construction entity that provides materials containing VOC’s to the project.

2.1.3 MR Credit 4 – Recycled Content: Provide building materials with recycled content such that the sum of post-consumer recycled content plus ½ of the pre-consumer content constitutes a minimum of 20% of cost of materials used for Project:

2.1.3.1 Determine cost of post-consumer recycled content of an item by dividing weight of post-consumer recycled content by total weight of item and multiplying by cost of item.

2.1.3.2 Determine cost of post-consumer recycled content plus ½ of pre-consumer recycled content of an item by dividing weight of pre-consumer recycled content plus ½ of post-consumer recycled content in item by total weight of item and multiplying by cost of item.

2.1.3.3 Product labelling must follow requirements of FTC 16 CFR 260.7 (e) or CSA ISO 14021; information that includes confusing or misleading language will not be acceptable.

2.1.3.4 Do not include plumbing, mechanical and electrical components, or specialty items such as elevators and equipment in the calculation.
2.1.4 MR Credit 5 – Regional Materials: Provide 30% of building components that have been extracted, harvested, recovered and processed within 800 km; 2,400 km if shipped by rail or water, of the manufacturing site – and that final manufacturing site for these materials is located within 800 km; 2,400 km if shipped by rail or water, and as follows:

2.1.4.1 Determine percentage of materials based on weight contributing to the regional value.
2.1.4.2 Include only the percentage contributing to the total materials where only some fraction of a product or material is contributing to the regional value.
2.1.4.3 Do not include plumbing, mechanical and electrical components, or speciality items such as elevators and equipment in the calculation.
2.1.4.4 Include only materials that are permanently installed in the project.

2.1.5 MR Credit 6 – Rapidly Renewable Materials: Provide components representing 2.5% of the total value of all building materials and products that are derived from plants harvested within a 10 year cycle or shorter; such as bamboo, wool, cotton or other agrifibres.

2.1.6 MR Credit 7 – Certified Wood: Provide a minimum of 50% by cost of wood based materials that are produced from wood obtained from forests certified by an FSC accredited certification body to comply with FSC Principles and Criteria.

2.1.6.1 Wood based materials can include engineered wood products, or wood based panel products used in the following permanently installed applications:

2.1.6.1.1 Rough carpentry
2.1.6.1.2 Miscellaneous carpentry
2.1.6.1.3 Wood decking
2.1.6.1.4 Finish carpentry
2.1.6.1.5 Architectural woodwork
2.1.6.1.6 Wood paneling

2.1.6.2 Wood products purchased for temporary use during construction such as bracing, concrete formwork, pedestrian barriers, and other temporary protection may be included in the calculation provided that all temporary wood products are included.

2.1.7 IEQ Credit 4.1 – Low Emitting Materials, Adhesives and Sealants: Use adhesives and sealants for all materials to the interior side of building membranes that meet VOC limits listed in South Coast Air Quality Management District Rule #1168, July 1, 2005 and rule amendment January 7, 2005 and having the following maximum g/L VOC’s (not including water):

2.1.7.1 Architectural Applications:

2.1.7.1.1 Indoor Carpet Adhesives: 50
2.1.7.1.2 Carpet Pad Adhesives: 50
2.1.7.1.3 Wood Flooring Adhesives: 100
2.1.7.1.4 Rubber Floor Adhesives: 60
2.1.7.1.5 Subfloor Adhesives: 50
2.1.7.1.6 Ceramic Tile Adhesives: 65
2.1.7.1.7 Vinyl Composite Tile Adhesives: 50
2.1.7.1.8 Asphalt Adhesives: 50
2.1.7.1.9 Drywall and Panel Adhesives: 50
2.1.7.1.10 Cove Base Adhesives: 50
2.1.7.1.11 Structural Glazing Adhesives: 100
2.1.7.1.12 Multipurpose Construction Adhesives: 70

2.1.7.2 Specialty Applications:

2.1.7.2.1 PVC Welding: 510
2.1.7.2.2 CPVC Welding: 490
2.1.7.2.3 ABS Welding: 325
2.1.7.2.4 Plastic Cement Welding: 250
2.1.7.2.5 Adhesive Primer for Plastic: 550
2.1.7.2.6 Contact Adhesive: 80
2.1.7.2.7 Special Purpose Contact Adhesive: 250
2.1.7.2.8 Structural Wood Member Adhesive: 140
2.1.7.2.9 Sheet Applied Rubber Lining Operations: 850
2.1.7.2.10 Top and Trim Adhesive: 250

2.1.7.3 Substrate Specific Applications:

2.1.7.3.1 Wood Glues: 30
2.1.7.3.2 Metal to Metal Adhesives: 30
2.1.7.3.3 Plastic Foam Adhesives: 50
2.1.7.3.4 Fibreglass Adhesives: 80
2.1.7.3.5 Adhesives for Porous Materials (except wood): 50

2.1.7.4 Sealant Primers:

2.1.7.4.1 Architectural, non-porous: 250
2.1.7.4.2 Architectural, porous: 775
2.1.7.4.3 Other: 750

2.1.7.5 Sealants:

2.1.7.5.1 Architectural: 250
2.1.7.5.2 Non-Membrane Roof: 775
2.1.7.5.3 Roadway: 250
2.1.7.5.4 Single Ply Roof Membrane: 450
2.1.7.5.5 Other: 120

2.1.7.6 Aerosol Adhesives: Green Seal Standard for Commercial Adhesives GS-36, October 19, 2000, percentage by weight (not including water):

2.1.7.6.1 General Purpose, mist spray: 65%
2.1.7.6.2 General Purpose, web spray: 55%
2.1.7.6.3 Special Purpose (all types): 70%

2.1.8 IEQ Credit 4.2 – Low Emitting Materials, Paints and Coatings: Use paints and coatings for interior applications that meet the following VOC limits in the referenced standards:

<table>
<thead>
<tr>
<th>PRODUCT TYPE</th>
<th>REFERENCE STANDARD</th>
<th>VOC LIMIT (g/L MINUS WATER)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Interior Flat Coating or Primer</td>
<td>Green Seal GS-11, 1993</td>
<td>50</td>
</tr>
<tr>
<td>Interior Non-Flat Coating or Primer</td>
<td>Green Seal GS-11, 1993</td>
<td>150</td>
</tr>
<tr>
<td>Anti-Corrosive / Anti-Rust Paint</td>
<td>Green Seal GC-03, 2nd Edition, 1997</td>
<td>250</td>
</tr>
<tr>
<td>Clear Wood Finishes: Lacquer</td>
<td>SCAQMD Rule 1113, 2004</td>
<td>550</td>
</tr>
<tr>
<td>Clear Wood Finishes: Sanding Sealers</td>
<td>SCAQMD Rule 1113, 2004</td>
<td>350</td>
</tr>
<tr>
<td>Clear Wood Finishes: Varnish</td>
<td>SCAQMD Rule 1113, 2004</td>
<td>350</td>
</tr>
<tr>
<td>Clear Brushing Lacquer</td>
<td>SCAQMD Rule 1113, 2004</td>
<td>680</td>
</tr>
<tr>
<td>Floor Coatings</td>
<td>SCAQMD Rule 1113, 2004</td>
<td>100</td>
</tr>
<tr>
<td>Sealers and Undercoaters</td>
<td>SCAQMD Rule 1113, 2004</td>
<td>200</td>
</tr>
<tr>
<td>Shellac: Clear</td>
<td>SCAQMD Rule 1113, 2004</td>
<td>730</td>
</tr>
<tr>
<td>Shellac: Pigmented</td>
<td>SCAQMD Rule 1113, 2004</td>
<td>550</td>
</tr>
<tr>
<td>Stain</td>
<td>SCAQMD Rule 1113, 2004</td>
<td>250</td>
</tr>
<tr>
<td>Concrete-Curing Compounds</td>
<td>SCAQMD Rule 1113, 2004</td>
<td>350</td>
</tr>
<tr>
<td>Japans/Faux Finishing Coatings</td>
<td>SCAQMD Rule 1113, 2004</td>
<td>350</td>
</tr>
<tr>
<td>Magnesite Cement Coatings</td>
<td>SCAQMD Rule 1113, 2004</td>
<td>450</td>
</tr>
<tr>
<td>Pigmented Lacquer</td>
<td>SCAQMD Rule 1113, 2004</td>
<td>550</td>
</tr>
<tr>
<td>Waterproofing Sealers</td>
<td>SCAQMD Rule 1113, 2004</td>
<td>250</td>
</tr>
<tr>
<td>Waterproofing Concrete/ Masonry Sealers</td>
<td>SCAQMD Rule 1113, 2004</td>
<td>400</td>
</tr>
<tr>
<td>Wood Preservatives</td>
<td>SCAQMD Rule 1113, 2004</td>
<td>350</td>
</tr>
<tr>
<td>Low-Solids Coatings</td>
<td>SCAQMD Rule 1113, 2004</td>
<td>120*</td>
</tr>
</tbody>
</table>

*Note: VOC levels for Low-Solids Coatings are measured in grams of VOC per litre of material, including water

2.1.8.1 Paint and coating products must not contain any carcinogenic, mutagenic or reproductive toxins; hazardous air pollutants or ozone depleting compounds with the exception of titanium dioxide, carbon black and naturally occurring chlorinated organic compounds resulting from water treatment and supply with limitations as indicated in GS-11 referenced above; the following specific compounds are strictly prohibited:

2.1.8.1.1 1,2-dichlorobenzene
2.1.8.1.2 Alkylphenol ethoxylates (APEs)
2.1.8.1.3 Formaldehyde-donors
2.1.8.1.4 Heavy metals, including lead, mercury, cadmium, hexavalent chromium and antimony in the elemental form or compounds
2.1.8.1.5 Phthalates
2.1.8.1.6 Triphenyl tins (TPT) and tributyl tins (TBT)

2.1.8.2 Source paints and coatings having a maximum Volatile Aromatic Compound limit of 0.5% by weight of the sum of total VAC’s within the product limitations as indicated in GS-11 referenced above; and includes compounds such as the following:

2.1.8.2.1 Acrolein
2.1.8.2.2 Acrylonitrile
2.1.8.2.3 Benzene
2.1.8.2.4 Butyl benzyl phthalate
2.1.8.2 Ethylbenzene
2.1.8.2.6 Isoeicosane
2.1.8.2.7 Methyl ethyl ketone
2.1.8.2.8 Methyl isobutyl ketone
2.1.8.2.9 Methylene chloride
2.1.8.2.10 Naphthalene
2.1.8.2.11 Toluene (methylbenzene)
2.1.8.2.12 1,1,1-trichloroethane
2.1.8.2.13 Vinyl chloride

2.1.9 IEQ Credit 4.3 – Low Emitting Materials, Flooring Systems: Source flooring materials that reduce quantity of indoor air contaminants that are odorous, irritating or harmful to the comfort and well being of installers and occupants and as follows:

2.1.9.1 Soft surface flooring such as carpet and carpet cushions that are required for the project must meet testing and product requirements for Carpet and Rug Institute’s Green Label Plus Program with carpet adhesives meeting requirements of IEQ 4.1 listed above.

2.1.9.2 Hard surface and resilient floor coverings such as vinyl, linoleum, laminate flooring, engineered wood flooring, ceramic flooring, rubber flooring and wall base must be certified as compliant with SCS FloorScore system with flooring adhesives meeting requirements of IEQ 4.1 listed above.

2.1.9.3 Concrete, wood, bamboo and cork floor finishes such as sealers, stains and finishes must meet requirements of South Coast Air Quality Management District Rule #1113 VOC limits indicated in IEQ 4.2 listed above.

2.1.9.4 Tile setting adhesives, mortar and grout having the following maximum g/L VOC’s (not including water) established by South Coast Air Quality Management District Rule #1168 as follows:

2.1.9.4.1 Ceramic Tile Adhesives: 65
2.1.9.4.2 Grout and mortar: 250

2.1.9.5 Materials meeting testing and product requirements of California Department of Public Health Standard Practice for the Testing of VOC Emissions from Various Sources using Small-Scale Environmental Chambers will be considered as acceptable alternates to the materials listed above.

2.1.10 IEQ Credit 4.4 – Low Emitting Materials, Composite Wood and Agrifibre Products: Do not use composite wood and agrifibre products and related adhesives that contain added urea formaldehyde resin for permanently installed products such as particleboard, medium density fibreboard, plywood, wheatboard, strawboard, panel substrates and door cores.

3 Execution

3.1 CONSULTANT’S ROLE IN LEED®

3.1.1 Consultant has assigned a person titled the LEED® Champion who will be responsible for compiling information provided by the Construction Manager; the Construction Manager will be required to cooperate with this person and provide the required information in a timely manner.
3.1.2 Consultant will prepare a LEED® Tracking Sheet indicating Prerequisites and Credits required for the Project and include responsibility for obtaining information from the project team, including the requirements listed in this Section required by the Construction Manager.

3.1.3 Project Materials Cost Data: Consultant will use Total Construction Cost Data provided by the Construction Manager to calculate Default Materials Cost at a rate 45% for submissions requiring Project Cost information.

3.2 CONSTRUCTION MANAGER’S ROLE IN LEED®

3.2.1 Measurements and Documentation:

3.2.1.1 The majority of contribution from the Construction Manager will be in the form of gathering and forwarding required documentary evidence required from Trade Contractors and submitted to the Consultant.

3.2.1.2 Submit documentation as soon as it becomes available:

3.2.1.2.1 This is an ongoing activity for the duration of the project and cannot be postponed until the end of construction.

3.2.1.2.2 It is a continuous trail of compiled evidence, such as having a diligent plumber or electrician collecting scraps of copper for recycling, where the plumber or electrician provides proof of delivery to a recycling depot for each load in the form of a waybill or similar document.

3.2.1.3 Examples of documentation that could be required for the Project includes obtaining proof of contribution from material manufacturers, taking pictures of Construction Activity Pollution Prevention, or creating checklists for construction indoor air quality management plan.

3.2.2 Coordination of Submittal Information:

3.2.2.1 Specifications prepared for the Project and included in the Project Manual indicate specific submittal related information.

3.2.2.2 Construction Manager must verify that Trade Contractors and suppliers providing products to the project are aware of LEED® related information including information that may be contained outside of the technical specification sections, i.e.: general information contained in Division 01 – General Requirements.

3.2.2.3 Obtain input for alternative materials and methods from knowledgeable suppliers and Trade Contractors, and make this information available to the Consultant for potential incorporation into the project.

3.2.3 Construction Manager’s LEED® Coordinator:

3.2.3.1 Name a Coordinator who will be responsible for providing continuous monitoring and tracking documentation so that it is kept up-to-date, and who will coordinate requirements for education with the Consultant.

3.2.3.2 Coordinator may be the Project Manager or may be someone else at the choice of the Construction Manager; the Coordinator should have a close working relationship with the Project Manager where they are different personnel. Coordinator should be someone other than the Project Manager; and if this is the case, the Coordinator should have a close working relationship with the Project Manager.

3.2.3.3 Coordinator will work with the Consultant and coordinate supply of documentation required for the Submission.
3.3 MATERIAL INFORMATION SHEET

3.3.1 The following suggested format will be provided to assist the Construction Manager and Trade Contractors for the types of material information submittals required for the project.

3.3.2 An electronic version will be made available by the Consultant; prepare a separate sheet for each material contributing to LEED® ratings for the Project.

REMAINDER OF PAGE LEFT INTENTIONALLY BLANK
**MATERIAL INFORMATION SHEET for LEED® SUBMITTALS**

Use this Check Sheet in conjunction with the Canadian Green Building Council’s (CaGBC) LEED® Green Building Rating System Version and Construction Type used for the Project to determine information requirements.

<table>
<thead>
<tr>
<th>Project Name and Number:</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Company Name and Address:</td>
<td></td>
</tr>
<tr>
<td>Contact Name and Number:</td>
<td></td>
</tr>
<tr>
<td>Signature:</td>
<td>Date:</td>
</tr>
<tr>
<td>(Signature of Contact Person)</td>
<td></td>
</tr>
</tbody>
</table>

**Specification Section Number and Material Description:**

<table>
<thead>
<tr>
<th>Finish Designation Number or Abbreviation:</th>
<th>(Description from Drawing – if any)</th>
</tr>
</thead>
</table>

| Material Cost: (Total Cost of Materials only – do not include labour, equipment and transportation costs) | $ |

<table>
<thead>
<tr>
<th>Sustainable Sites</th>
<th>Heat Island Effect: Roof</th>
<th>SS Credit 7.2</th>
</tr>
</thead>
<tbody>
<tr>
<td>Provide supporting documentation indicating compliance with reflectance and emissivity, or SRI of roofing materials.</td>
<td>Does this material meet or exceed the requirements for Solar Reflective Index (SRI) of 78 for roofs having slopes of ≤2:12 or less, or 29 for roofs having slopes of ≥2:12 for a minimum of 75% of the roof surface?</td>
<td>Yes ☐ No ☐</td>
</tr>
<tr>
<td>Comments:</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Energy and Atmosphere</th>
<th>Ozone Protection</th>
<th>EA Credit 4</th>
</tr>
</thead>
<tbody>
<tr>
<td>Provide supporting documentation indicating compliance with requirements.</td>
<td>Do refrigerant materials used in HVAC and R equipment meet the requirements for compliance with the Montreal Protocol for reduction of ozone depleting refrigerants?</td>
<td>Yes ☐ No ☐</td>
</tr>
<tr>
<td>Comments:</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Materials and Resources</th>
<th>Resource Reuse</th>
<th>MR Credit 3</th>
</tr>
</thead>
<tbody>
<tr>
<td>If material is reused, use market replacement value (Value should match material cost listed above)</td>
<td>Is this material; in whole or in part, salvaged, refurbished, or reused?</td>
<td>Yes ☐ No ☐</td>
</tr>
<tr>
<td>If Yes, list value of salvaged, refurbished, or reused part of this material:</td>
<td>$</td>
<td></td>
</tr>
<tr>
<td>Comments:</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Materials and Resources</th>
<th>Recycled Content – Supplementary Cementing Materials (SCM’s)</th>
<th>MR Credit 4</th>
</tr>
</thead>
<tbody>
<tr>
<td>Submit a letter signed by concrete supplier or their delegated design professional engineer certifying the reduction in portland cement from Base Mix to Actual SCM.</td>
<td>Does this material; in whole or in part, contain SCM recycle content? If so submit separate sheets summarizing the following:</td>
<td>Yes ☐ No ☐</td>
</tr>
<tr>
<td>Mix Number</td>
<td>Portland Cement Used (kg/m³)</td>
<td></td>
</tr>
<tr>
<td>Concrete Design Strength at 28 days (MPa)</td>
<td>Volume of mix (m³)</td>
<td></td>
</tr>
<tr>
<td>Air Entrainment (yes or no)</td>
<td>Cost of Concrete Materials</td>
<td></td>
</tr>
<tr>
<td>Base Portland Cement Content (kg/m³)</td>
<td>Cost of Formwork Materials</td>
<td></td>
</tr>
<tr>
<td>Comments:</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

LEED® is a measurement system for new and existing buildings based on sustainable design principles. Information listed in the Material Information Sheet is required for materials used in the project. This information will be used as supporting documentation for the Project LEED® application. Submit requested documentation to confirm that information provided in this form is accurate. Information provided on the Material Information Check Sheet for LEED Submittals will be considered as Confidential Information and will not be used outside of the strict requirements for measuring LEED project performance requirements. It is a contractual requirement to complete all required fields of this Material Information Check Sheet for LEED Submittals. Use a separate sheet for each material.
1 Consumer waste that has become a raw material (feedstock) for another product.
2 Output from a process that has not been used as part of a consumer product, that is sold, traded or exchanged under commercial terms (including auditable transactions between profit centres within an organization) as feedstock for another industrial process, and that would otherwise be landfilled, incinerated or somehow disposed of as waste.
3 Manufacturing refers to the final assembly of components into the building product that is furnished and installed by the tradesmen. Extraction refers to location where raw materials were mined or harvested prior to manufacturing processes.

### MATERIAL INFORMATION CHECK SHEET for LEED® SUBMITTALS

<table>
<thead>
<tr>
<th>Material Type</th>
<th>Description</th>
<th>Credit</th>
<th>Yes</th>
<th>No</th>
<th>Percentage</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>4B. Recycled Content – All Other Materials</td>
<td>Description and attach recycled content material information source.</td>
<td>MR Credit 4</td>
<td>Yes</td>
<td>No</td>
<td>%</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Does this material, in whole or in part, contain Post Consumer or Pre-Consumer recycle content?</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Percentage by Weight of Post Consumer recycled portion:</td>
<td></td>
<td></td>
<td></td>
<td>%</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Percentage by Weight of Pre-Consumer recycled portion:</td>
<td></td>
<td></td>
<td></td>
<td>%</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Total Percentage by Weight of material/product:</td>
<td></td>
<td></td>
<td></td>
<td>%</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Comments:</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5. Regional Materials</td>
<td>Describe and attach information indicating evidence showing distance from final point of manufacture to the site and mode of transportation, and distances from materials extraction to the site.</td>
<td>MR Credit 5</td>
<td>Yes</td>
<td>No</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>If only a fraction of a product or material is extracted, harvested, recovered, processed and manufactured locally, then only that percentage (by weight) must contribute to the regional value.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Comments:</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>6. Rapidly Renewable Materials</td>
<td>Describe and attach documentation of rapidly renewable materials and information source.</td>
<td>MR Credit 6</td>
<td>Yes</td>
<td>No</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Is this material made from a rapidly renewable resource?</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>List value of rapidly renewable portion:</td>
<td></td>
<td></td>
<td>$</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>List Percentage of rapidly renewable components</td>
<td></td>
<td></td>
<td>%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>7. Certified Wood – Applies only to permanently installed materials.</td>
<td>Attach FSC Chain-of-Custody certificate number and description of materials meeting certified wood requirement for permanently installed materials only.</td>
<td>MR Credit [7] [6]</td>
<td>Yes</td>
<td>No</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Is this wood based product or material certified by the Forest Stewardship Council (FSC):</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>If yes, list value of the FSC Certified portion of the product or assembly:</td>
<td></td>
<td></td>
<td>$</td>
<td></td>
<td></td>
</tr>
<tr>
<td>8. Low Emitting Materials</td>
<td>Provide product cut sheets, MSDS or signed official literature from manufacturer indicating VOC Content for adhesives and sealants, paints and coatings, carpets, and composite wood and AgriFiber products.</td>
<td>EQ Credits 4.1, 4.2, 4.3 and 4.4</td>
<td>Yes</td>
<td>No</td>
<td>g/Litre</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Do adhesives, sealants, paints and coatings, or carpet materials comply with volatile organic compound (VOC) limits established by LEED?</td>
<td></td>
<td></td>
<td>No</td>
<td>g/Litre</td>
<td></td>
</tr>
<tr>
<td></td>
<td>List VOC content (percentages and parts per units are not acceptable):</td>
<td></td>
<td></td>
<td></td>
<td>g/Litre</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Does composite wood or AgriFiber product comply with requirement for no added urea-formaldehyde resins in accordance with LEED?</td>
<td></td>
<td></td>
<td>Yes</td>
<td>No</td>
<td></td>
</tr>
<tr>
<td>9. Additional Supporting Information:</td>
<td>(Attach additional sheets as required to provide full supporting documentation)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

---

1 Consumer waste that has become a raw material (feedstock) for another product.
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LEED Canada NC 2009

<table>
<thead>
<tr>
<th>Sustainable Sites</th>
<th>17</th>
<th>2</th>
<th>7</th>
<th>6</th>
<th>Responsibility</th>
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</thead>
<tbody>
<tr>
<td>Construction Activity Pollution Prevention</td>
<td>SS1</td>
<td>SS2</td>
<td>SS3</td>
<td>SS4</td>
<td>Civil Engineer</td>
</tr>
<tr>
<td>Site Selection</td>
<td>1</td>
<td>1</td>
<td>SS1</td>
<td>Architect</td>
<td></td>
</tr>
<tr>
<td>Development Density &amp; Community Connectivity</td>
<td>5</td>
<td>5</td>
<td>SS2</td>
<td>Architect</td>
<td></td>
</tr>
<tr>
<td>Brownfield Redevelopment</td>
<td>1</td>
<td>1</td>
<td>SS3</td>
<td>Architect</td>
<td></td>
</tr>
<tr>
<td>Alternative Transportation: Public Transportation Access</td>
<td>6</td>
<td>6</td>
<td>SS4.1</td>
<td>Architect</td>
<td></td>
</tr>
<tr>
<td>Alternative Transportation: Bicycle Storage &amp; Changing Rooms</td>
<td>1</td>
<td>1</td>
<td>SS4.2</td>
<td>Architect</td>
<td></td>
</tr>
<tr>
<td>Alternative Transportation: Low-Emitting and Fuel-Efficient Vehicles</td>
<td>3</td>
<td>3</td>
<td>SS4.3</td>
<td>Architect</td>
<td></td>
</tr>
<tr>
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TARGETED TOTAL: 67 / 110

Certified: Gold

Updated: 17-12-2014
1 General

1.1 RELATED REQUIREMENTS

1.1.1 Section 01 42 19 – Reference Standards: Standards specifically referenced by the governing Building Code.

1.2 DEFINITIONS

1.2.1 Regulatory Requirements: Regulatory requirements means 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 performance of Work.

1.2.2 Governing Building Code: Work of this Project is based minimum requirements of the 2006 Alberta Building Code, which is considered as the Governing Building Code requirements for the Project:

1.2.2.1 Specific design and performance requirements listed in the specifications or indicated on the Drawings may exceed the minimum requirements established by the referenced Building Code; these requirements will govern over the minimum requirements listed in the Building Code.

1.3 QUALITY ASSURANCE

1.3.1 Regulatory Requirements: Except as otherwise specified, Trade Contractor shall apply for, obtain, and pay all fees associated with, permits, licenses, certificates, and approvals required by regulatory requirements and Contract Documents, based on General Conditions and Supplementary Conditions of Contract and the following:

1.3.1.1 Regulatory requirements and fees in force on date of Bid submission, and,

1.3.1.2 Any change in regulatory requirements or fees scheduled to become effective after date of tender submission and of which public notice has been given before date of tender submission.

2 Products

2.1 CONTRACT DOCUMENTS

2.1.1 Trade Contractor shall not be responsible for verifying that Contract Documents comply with regulatory requirements, except for where Delegated Design criteria listed in Section 01 33 50 – Delegated Design Submittals require a professional engineer to design specific elements of construction.

2.1.2 If Contract Documents are at variance, or changes that require modification to Contract Documents are made to regulatory requirements, by Authority Having Jurisdiction, subsequent to date of Bid closing, Trade Contractor shall notify Construction Manager in writing, requesting direction, immediately such variance or change becomes known to them.

2.1.3 Owner may make changes required to Contract Documents, and any resulting change in Contract Price or Contract Time will be made in accordance with of Contract and Supplementary Conditions.
2.1.4 If Trade Contractor fails to notify Construction Manager in writing and obtain Owner's direction as required and performs Work knowing it to be contrary to regulatory requirements, Trade Contractor shall be responsible for and shall correct violations thereof and shall bear costs, expenses, and damages attributable to his failure to comply with provisions of such regulatory requirements.

2.2 EASEMENTS AND NOTICES

2.2.1 Owner will obtain permanent easements and rights of servitude that may be required for performance of Work.

2.2.2 Construction Manager will give notices required by regulatory requirements.

2.3 PERMITS

2.3.1 Development Permit: Owner has applied for, obtained, and paid for development permit.

2.3.2 Building Permit:

2.3.2.1 Consultant shall apply for, obtain and pay for building permit on behalf of Owner, and other permits required for Work and its various parts.

2.3.2.1.1 Construction Manager will require that specific Trade Contractors obtain and pay for permits required by authorities having jurisdiction, where their Work is affected by Work requiring permits.

2.3.2.2 Construction Manager will display building permit and other permits in a conspicuous location at Place of Work.

2.3.3 Occupancy Permits:

2.3.3.1 Construction Manager will apply for, obtain, and pay for occupancy permits, including partial occupancy permits where required by authority having jurisdiction.

2.3.3.2 Construction Manager will issue appropriate instructions to Trade Contractor for correction to Work where Contract Document deficiencies are required to be corrected in order to obtain occupancy permits, including partial occupancy permits.

2.3.3.3 Trade Contractor shall correct deficiencies in accordance with Construction Manager's instructions. Where deficiency is not corrected, Owner reserves the right to make correction and charge Trade Contractor for costs incurred.

2.3.3.4 Construction Manager will turn occupancy permits over to Owner after Trade Contractors have completed their portions of Work.

3 Execution

3.1 NOT USED

END OF SECTION
1 General

1.1 SUMMARY

1.1.1 All references to codes, standards and standard specifications referred to in these Specifications or used on drawings shall mean and intend to be the currently adopted edition, amendment and revision of such reference standards in effect at the time of Bid closing.

1.1.2 In the event that the most current version of a code, standard or standard specification differs from the version indicated in these Specifications:

1.1.2.1 Report the discrepancy to the Consultant immediately.
1.1.2.2 The most current standard will be used to establish the quality of the work or material being referenced.

1.1.3 Referenced standards and code requirements shall be considered minimum requirements only. The Specifications may indicate additional requirements in excess of those established by referenced codes and standards.

1.1.4 Applicable portions of Standards used that are not in conflict with the Contract Documents are hereby made a part of the Specifications.

1.1.5 Modifications or exceptions to Standards shall be considered as amendments, and unmodified portions shall remain in full effect.

1.1.6 In cases of discrepancies between the Specifications and Standards, the requirements of the Specification shall govern.

1.1.7 In cases of discrepancies between Codes and the Specifications, the Code requirements shall govern.

1.1.8 Where references to Codes or Standards are used in these Specifications, the Construction Manager and Trade Contractors must familiarize themselves with the applicable portions and shall be governed by the requirements affecting the Project.

1.1.9 The Construction Manager shall furnish an affidavit, when requested by the Consultant, from manufacturers certifying that materials or products delivered to the project meet the requirements specified. Such certifications, however, shall not relieve the Construction Manager or their Trade Contractors from the responsibility of complying with any added requirements specified in the Contract Documents.

1.2 RELATED REQUIREMENTS

1.2.1 Section 01 41 00 – Regulatory Requirements: Governing Building Code relating to standards applicable to project.

1.3 STANDARDS ORGANIZATIONS

1.3.1 The following list of standards organizations indicate the most common standards that may be referenced within the technical specifications:

1.3.1.1 ANSI - American National Standards Institute
1.3.1.2 ASTM - American Society for Testing and Materials
1.3.1.3 CGA - Canadian Gas Association
1.3.1.4 CGSB - Canadian General Standards Board
1.3.1.5 CSA - Canadian Standards Association
1.3.1.6 CAN1 - National Standard of Canada (published by CGA)
1.3.1.7 CAN2 - National Standard of Canada (published by CGSB)
1.3.1.8 CAN3 - National Standard of Canada (published by CSA)
1.3.1.9 CAN4 - National Standard of Canada (published by ULC)
1.3.1.10 ULC - Underwriters Laboratories of Canada
1.3.1.11 UL or ULI - Underwriters Laboratories Inc.
1.3.1.12 WHI - Warnock Hersey | Intertek Testing Services

1.3.2 The following limitations on marks issued by standards organizations will apply to the standards issued by the organizations listed in 1.3.1 above:

1.3.2.1 Underwriters Laboratories Inc.: Only systems designated by “cUL” or “cULus” will be acceptable for use on this project. Systems indicating “UL” or “ULus” will only be considered where local authorities having jurisdiction have reviewed and accepted the systems in writing.

1.3.2.2 Warnock Hersey Intertek: Only materials designated by “cWHI” or “cWHIus” will be acceptable for use on this project. Materials bearing a “WH”, “WHI” or “WHIus” mark will only be considered where local authorities having jurisdiction have reviewed and accepted the materials in writing.

1.3.2.3 Construction Manager and Trade Contractor will be responsible for obtaining written acceptance of materials and submitting them to the Consultant prior to installation.

1.4 ABBREVIATIONS

1.4.1 Additional Technical Societies, Associations, or Standards may be referenced in these Specifications in addition to the following abbreviations:

<table>
<thead>
<tr>
<th>Name of Association</th>
<th>Abbreviation</th>
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<td>Acoustical Materials Association</td>
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<td>Air Movement &amp; Control Association</td>
<td>AMCA</td>
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<td>ABC</td>
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<td>CISC</td>
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<td>Ceilings &amp; Interior Systems Construction Association</td>
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2 Products

2.1 NOT USED

3 Execution

3.1 NOT USED

END OF SECTION
1 General

1.1 SUMMARY

1.1.1 This section includes administrative and procedural requirements for quality control for the project and provides activities performed by the Consultant and Owner, the Construction Manager and Trade Contractors.

1.1.2 Quality Audit services are required to verify compliance with requirements specified or indicated within the Contract Documents; these services do not relieve Trade Contractor of responsibility for their own Quality Assurance and Quality Control requirements:

1.1.2.1 Specific quality control requirements for individual construction activities are specified in the sections that specify those activities; requirements in those sections may also cover production of standard products.

1.1.2.2 Specified tests, inspections, and related actions do not limit Construction Manager's and Trade Contractors' quality control procedures that facilitate compliance with the Contract Document requirements.

1.1.2.3 Requirements for Construction Manager to provide quality control services required by Contract Documents, Owner, or Authorities Having Jurisdiction are not limited by provisions of this section.

1.1.3 This section specifies general requirements and procedures for construction of mock-ups required for quality assurance and confirmation of assembly techniques; additional specific requirements for mock-ups are specified in individual sections of Divisions 02 to 49.

1.2 RELATED REQUIREMENTS

1.2.1 Construction Manager's: Quality Control requirements relating to Trade Contractors' responsibilities to Construction Manager's quality assurance and quality control program.

1.2.2 Section 01 32 00 – Schedules: Develop a schedule of required tests and inspections, and construction of required mock-ups.

1.2.3 Section 01 33 00 – Submittal Procedures: Submission requirements for required documentation listed in this Section.

1.2.4 Section 01 33 50 – Delegated Design Submittals: Submittals requiring design services of professional engineer and that have been assigned to the Construction Manager.

1.2.5 Section 01 42 19 – Reference Standards

1.2.6 Section 01 73 29 – Cutting and Patching: Repair and restoration of construction disturbed by testing and inspecting activities.

1.2.7 Quality Assurance, and Source and Site Quality Control requirements are identified within individual technical specification sections of the Contract Documents.
1.3 DEFINITIONS

1.3.1 Trade Quality Control Plan (TQCP): Trade Contractor’s written and detailed quality control plan submitted to the Construction Manager before starting any work for the Project.

1.3.2 Quality Assurance: Activities, actions, and procedures performed before and during execution of the Work by the Construction Manager to protect against defects and deficiencies and confirming that construction is consistent with regulatory requirements, qualification statements and certification requirements listed within the Contact Documents.

1.3.3 Quality Control (Testing by Trade Contractor): Tests, inspections, procedures, and related actions performed by the Trade Contractor during and after execution of the Work using third party testing agency to verify that completed construction complies with specified standards and technical requirements within the Contract Documents; these services do not include contract administration and reporting performed by Consultant, or Quality Auditing activities performed by Owner.

1.3.4 Quality Audit (Testing by Owner): Tests, inspections, procedures and related actions performed by the Owner during and after execution of the Work using third party testing agency to establish that work complies with Contract Documents and are additional to the Quality Control and Assurance provided by the Construction Manager, or contract administration and reporting performed by Consultant.

1.3.5 Mock-ups: Full size, physical example assemblies to illustrate finishes and materials. Mock-ups are used to verify selections made under sample submittals, to demonstrate aesthetic effects and, where indicated, qualities of materials and execution, and to review construction, coordination, testing, or operation; they are not samples; mock-ups establish the standard by which the Work will be judged.

1.3.6 Testing Agency: An entity engaged to perform specific tests, inspections, or both. Testing laboratory shall mean the same as testing agency.

1.4 REFERENCE STANDARDS

1.4.1 Within the text of the project Manual, reference may be made to the standards referenced in Section 01 42 19; testing of materials may be requested by the Owner, to prove conformance with these standards.

1.4.2 The referenced standards and any amendments or updates that may be in force on the day of receipt of Bids shall be applicable to the work during the duration of the Contract.

1.5 ADMINISTRATIVE REQUIREMENTS

1.5.1 Delegated Design: Provide letters of commitment and compliance where design services or certifications by a design a professional engineer are specifically required of Construction Manager by the Contract Documents in accordance with Section 01 33 50.

1.5.2 Coordination of Testing by Construction Manager: Construction Manager will coordinate all testing required by Owner and individual requirements of the specifications; Trade Contractor shall provide to Construction Manager test results from testing performed by Trade Contractor and as required by technical specifications.
1.5.3 Scheduling Testing Activities: Schedule activities to accommodate required quality assurance and quality control services with a minimum of delay and to avoid necessity of removing and replacing construction to accommodate testing and inspecting:

1.5.3.1 Schedule times for tests, inspections, obtaining samples, and similar activities.

1.5.3.2 Distribution: Distribute schedule to Owner, Consultant, testing agencies, and each party involved in performance of portions of the Work where tests and inspections are required.

1.6 SUBMITTALS

1.6.1 Provide required information in accordance with Section 01 33 00 – Submittal Procedures.

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

1.6.2.1 Qualification Data: For testing agencies specified in this Section to demonstrate their capabilities and experience. Include proof of qualifications in the form of a recent report on the inspection of the testing agency by a recognized authority.

1.6.2.2 Delegated Design Submittals: In addition to Shop Drawings, Product Data, and other required submittals, submit a statement, signed and sealed by the responsible design professional, for each product and system specifically assigned to responsible Trade Contractor to be designed or certified by a design professional, indicating that the products and systems are in compliance with performance and design criteria indicated:

1.6.2.2.1 Include list of codes, loads, and other factors used in performing these services.

1.6.2.2.2 Include Letter of Commitment and Letter of Compliance when directed by technical specification section.

1.6.2.3 Schedule of Tests and Inspections: Prepare in tabular form and include the following:

1.6.2.3.1 Specification section number and title
1.6.2.3.2 Description of test and inspection
1.6.2.3.3 Identification of applicable standards
1.6.2.3.4 Identification of test and inspection methods
1.6.2.3.5 Number of tests and inspections required
1.6.2.3.6 Time schedule or time span for tests and inspections
1.6.2.3.7 Entity responsible for performing tests and inspections
1.6.2.3.8 Requirements for obtaining samples
1.6.2.3.9 Unique characteristics of each quality control service

1.6.2.4 Reports: Prepare and submit certified written reports that include the following:

1.6.2.4.1 Date of issue
1.6.2.4.2 Project title and number
1.6.2.4.3 Name, address, and telephone number of testing agency
1.6.2.4.4 Dates and locations of samples and tests or inspections
1.6.2.4.5 Names of individuals making tests and inspections
1.6.2.4.6 Description of the Work and test and inspection method
1.6.2.4.7 Identification of product and Specification section
1.6.2.4.8 Complete test or inspection data
1.6.2.4.9 Test and inspection results and an interpretation of test results
1.6.2.4.10 Ambient conditions at time of sample taking and testing and inspecting
1.6.2.4.11 Comments or professional opinion on whether tested or inspected Work complies with the Contract Document requirements
1.6.2.4.12 Name and signature of laboratory inspector
1.6.2.4.13 Recommendations on re-testing and re-inspecting

1.6.2.5 Permits, Licenses, and Certificates: Submit copies of permits, licenses, certifications, inspection reports, releases, jurisdictional settlements, notices, receipts for fee payments, judgments, correspondence, records, and similar documents, established for compliance with standards and regulations bearing on performance of the Work for Owner's records.

1.6.3 Informational Submittals: Provide the following submittals during the course of the work:

1.6.3.1.1 Quality Management Plan (QMP): Written documents provided by the Construction Manager indicating quality assurance and quality control activities undertaken as follows:

1.6.3.1.2 Quality Assurance (QA): Submit proposed activities, actions, and procedures performed before and during execution of the Work to guard against defects and deficiencies and methods for making corrections to construction necessary to comply with Contract Documents.

1.6.3.1.3 Quality Control (QC): Submit schedule of tests, inspections, procedures, and related actions required necessary to verify that completed construction complies with Contract Documents.

1.7 QUALITY ASSURANCE

1.7.1 Qualifications: Provide proof of qualifications as directed by technical specification sections and as follows:

1.7.1.1 Fabricator Qualifications: A firm experienced in producing products similar to those indicated for this project and with a record of successful in service performance, as well as sufficient production capacity to produce required units.

1.7.1.2 Factory Authorized Service Representative Qualifications: An authorized representative of manufacturer who is trained and approved by manufacturer to inspect installation of manufacturer's products that are similar in material, design, and extent to those indicated for this project.

1.7.1.3 Installer Qualifications: A firm or individual experienced in installing, erecting, or assembling work similar in material, design, and extent to that indicated for this project, whose work has resulted in construction with a record of successful in service performance.

1.7.1.4 Manufacturer Qualifications: A firm experienced in manufacturing products or systems similar to those indicated for this project and with a record of successful in service performance.
1.7.1.5 Delegated Design Professional Engineer: Refer to Section 01 33 50 – Delegated Design Submittals for engineering requirements assigned to responsible Trade Contractor.

1.7.1.6 Professional Engineer Qualifications: A professional engineer who is legally qualified to practice in jurisdiction where project is located and who is experienced in providing engineering services of the kind indicated. Engineering services are defined as those performed for installations of the system, assembly, or product that are similar to those indicated for this project in material, design, and extent.

1.7.1.7 Testing Agency Qualifications: An agency with the experience and capability to conduct testing and inspecting indicated, and that specializes in types of tests and inspections to be performed.

1.8 MOCK-UPS

1.8.1 Before installing portions of the Work requiring mock-ups, build mock-ups for each form of construction and finish required to comply with the requirements of this section, and any additional requirements listed in the technical sections, using materials indicated for the completed Work.

1.8.2 Build mock-ups in location and of size indicated; or if not indicated, as directed by Consultant.

1.8.3 Notify Consultant seven (7) Working Days in advance of dates and times when mock-ups will be constructed:

1.8.3.1 Failure to prepare mock-up in ample time is not considered sufficient reason for an extension of Contract Time and no claim for extension by reason of such default will be allowed.

1.8.3.2 The Consultant will assist in preparing a schedule fixing the dates for preparation or mock-ups when requested in writing by the Construction Manager.

1.8.4 Mock-up is required to demonstrate proposed range of aesthetic effects and workmanship:

1.8.4.1 Obtain Consultant’s acceptance of mock-ups prior to starting work, fabrication, or construction; unacceptable mock-ups shall be modified or replaced as directed by the Consultant as required to obtain acceptance.

1.8.4.2 Maintain mock-ups during construction in an undisturbed condition as a standard for judging the completed Work.

1.8.4.3 Demolish and remove mock-ups from project site when directed by the Consultant; acceptable mock-ups in an undisturbed condition at the time of Substantial Performance may become part of the completed Work where they form a part of the completed Work.

2 Products

2.1 MOCK-UPS

2.1.1 Erect mock-ups on-site, at locations acceptable to Consultant.

2.1.2 Reviewed and accepted mock-ups will become standards of workmanship and material against which installed work will be assessed.
2.1.3 Required mock-ups are listed in the Technical Specification Sections (Divisions 02 through 49). Some mock-ups require several sections of work to cooperate and construct a complete assembly. Coordinate the activities of these sections to ensure that required mock-ups are completed.

2.1.4 Required mock-ups are listed in the Technical Sections (Divisions 02 through 26). Some mock-ups require several sections of work to cooperate and construct a complete assembly. Coordinate the activities of these sections to ensure that required mock-ups are complete.

2.1.4.1 The Consultant will require the following mock-ups:

2.1.4.1.1 Precast architectural concrete units
2.1.4.1.2 Sheet metal flashing and trim components
2.1.4.1.3 Crystalline waterproofing sample installation
2.1.4.1.4 Spray insulation with thermal barrier sample installation
2.1.4.1.5 Air and Vapour Barrier Membrane sample installation
2.1.4.1.6 Composite panel sample installation
2.1.4.1.7 Joint Sealants in mock-ups of assemblies
2.1.4.1.8 Curtain Wall multi-story visual mock-up, tested in Miami, Florida, USA, incorporating simulated framing elements and project glass for verification.
2.1.4.1.9 Back-painted glass mock-up, consisting of one clear rectangular unit + one back painted unit with 5 strips of colour directly adjacent to one another
2.1.4.1.10 Full-scale visual mock-up of two adjacent units using brake-shapes etc to represent mullion and panel conditions (colours will be approximate, but not fully representative, mock-up to occur in their shop). Mock-up will include stack joint conditions (fire-stopping enclosures etc), as well as at least one example of each panel type.
2.1.4.1.11 Mock-up of juncture of curtain wall and wood soffit prepared by StructureCraft.

2.1.5 Mock-ups that are found acceptable by the Consultant may form a part of the permanent work of the project. Where modifications are required, they shall be completed and form the standard of acceptance for the remainder of the project. Where mock-ups are found not acceptable, mock-up shall be repaired or replaced as directed. Remove mock-up at conclusion of Work or when notified of acceptance by Consultant. Specification sections identify whether the mock-up may remain as part of the Work or must be removed.
3 Execution

3.1 SITE QUALITY CONTROL

3.1.1 Technical specification sections indicate specific requirements for site quality control inspections and testing; this section provides the administrative requirements for conducting site quality control inspections and testing.

3.1.2 Owner Responsibilities for Quality Audits: Owner will engage a qualified testing agency to perform testing and inspections where quality control services are indicated as Owner's responsibility within the technical specification sections or where the Owner requires additional testing to confirm that performance requirements required by the Contract Documents as follows:

3.1.2.1 Owner will provide Construction Manager with names, addresses, and telephone numbers of testing agencies engaged and a description of the types of testing and inspecting they are engaged to perform.

3.1.2.2 Costs for re-testing and re-inspecting construction that replaces or is necessitated by work that failed to comply with the Contract Documents will be charged to responsible Trade Contractor.

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

3.1.3 Costs for testing and inspection required by technical specification sections or by Authority Having Jurisdiction are identified within affected technical specification sections as being paid for by the Owner, by the responsible Trade Contractor.

3.1.4 Trade Contractor's Responsibilities: Provide quality control services specified or required by Authority Having Jurisdiction:

3.1.4.1 Where services are indicated as responsible Trade Contractor's responsibility, engage a qualified testing agency to perform these quality control services; responsible Trade Contractor shall not employ the same entity engaged by Owner, unless agreed to in writing by Owner.

3.1.4.2 Where services are indicated as the Owner's responsibility, the Construction Manager shall contact Consultant and arrange with the Owner's testing and inspection personnel to perform their Work at proper times.

3.1.4.3 Notify testing agencies at least three (3) working days in advance of time when work requiring testing or inspecting will be performed.

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

3.1.4.5 Testing and inspecting requested by responsible Trade Contractor and not required by the Contract Documents are responsible Trade Contractor's responsibility.

3.1.4.6 Submit additional copies of each written report directly to Authority Having Jurisdiction when testing and inspections are required by the Authority Having Jurisdiction.
3.1.5 Construction Manager's Project Control: Use only specified materials or materials found acceptable by the Consultant; provide and maintain an effective quality control program and perform sufficient inspections and tests of all items of Work; including those of Trade Contractors, to verify compliance with Contract Documents:

3.1.5.1 Verify that installation is in accordance with the specified requirements, to manufacturer's written instructions, or to methods that have been submitted and found acceptable by the Consultant prior to proceeding with the Work.

3.1.5.2 Construction Manager will communicate these requirements to Trade Contractors immediately before their work commences at the site.

3.1.6 Trade Contractor’s Responsibility: Construction Manager is responsible for coordinating and assigning testing requirements to individual Trade Contractors:

3.1.6.1 Tests required by Trade Contractors shall be paid for by Trade Contractors, unless tests are specifically noted as being paid for by the Owner.

3.1.7 Manufacturer’s Site Services: Engage a factory authorized service representative to inspect site assembled components and equipment installation, including service connections where indicated and submit written report of findings or test results to Owner and Consultant.

3.1.8 Testing Agency Responsibilities: Cooperate with Owner, Consultant and Construction Manager in performance of duties; provide qualified personnel to perform required tests and inspections and as follows:

3.1.8.1 Notify Consultant and Construction Manager promptly of irregularities or deficiencies observed in the Work during performance of its services.

3.1.8.2 Interpret tests and inspections and state in each report whether tested and inspected work complies with or deviates from requirements.

3.1.8.3 Submit a certified written report, in duplicate, of each test, inspection, and similar quality control service through Construction Manager when tests are paid for by the Construction Manager, or to the Owner when paid for by the Owner.

3.1.8.4 Testing agency is not required to undertake any instruction that releases, revokes, alters or increases requirements of the Contract Documents or approves or accepts any portion of the Work.

3.1.8.5 Testing agency is not required to perform any duties of Construction Manager.

3.1.8.6 Testing agency is not required to perform any duties of the Consultant.

3.1.9 Associated Services: Cooperate with agencies performing required tests, inspections and similar quality control services, and provide reasonable auxiliary services as requested:

3.1.9.1 Notify agency sufficiently in advance of operations to permit assignment of personnel

3.1.9.2 Access to the Work

3.1.9.3 Incidental labour and facilities necessary to facilitate tests and inspections

3.1.9.4 Adequate quantities of representative samples of materials that require testing and inspecting

3.1.9.5 Assist agency in obtaining samples

3.1.9.6 Facilities for storage and site curing of test samples
3.1.9.7 Preliminary design mix proposed for use for material mixes that require control by testing agency

3.1.9.8 Security and protection for samples and for testing and inspecting equipment at project site

3.1.10 Repair: Repair damaged construction and restore substrates and finishes in accordance with Section 01 73 29 on completion of testing, inspecting, sample taking, and similar services:

3.1.10.1 Protect construction exposed by, or for quality control service activities.

3.1.10.2 Repair and protection are the responsibility of Construction Manager’s regardless of the assignment of responsibility for quality control services.

3.2 CLOSEOUT ACTIVITIES

3.2.1 Re-testing/Re-inspections: Regardless of whether original tests or inspections were responsible Trade Contractor’s responsibility, provide quality control services including re-testing and re-inspecting, for construction that revised or replaced Work that failed to comply with requirements established by the Contract Documents:

3.2.1.1 Costs for re-testing and re-inspections shall be paid for by the responsible Trade Contractor or as otherwise assigned to responsible Trade Contractor by the Construction Manager.

3.2.2 Correction of Rejected Work: Remove defective Work, whether the result of poor workmanship, use of defective products or damage and whether incorporated in the Work or not, which has been rejected by the Consultant as failing to conform to the Contract Documents:

3.2.2.1 Replace or re-execute in accordance with originally specified performance requirements.

3.2.2.2 Make good other work damaged by such removals or replacements promptly.

3.2.2.3 Owner may deduct from the Contract Price the difference in value between the Work performed and that called for by the Contract Documents; the amount of which will be determined by the Consultant, where corrective work is not expedient to repair rejected Work, or Work is not performed in accordance with the Contract Documents.

END OF SECTION
1 General

1.1 SUMMARY

1.1.1 Work in this Section includes, but is not limited to, requirements for construction activity pollution control during construction, which forms the Construction Manager’s commitment for sustainable site development and construction activities as follows:

1.1.1.1 Construction Manager’s responsibilities for development and implementation of an Erosion and Sedimentation Control Plan
1.1.1.2 Construction Manager’s responsibilities to confirm compliance with requirements of the Erosion and Sedimentation Control Plan

1.1.2 This Section includes guidelines and recommendations for developing the Construction Manager prepared Erosion and Sedimentation Control Plan required for LEED® SS Prerequisite 1 – Construction Activity Pollution Prevention.

1.2 AVAILABLE PROJECT INFORMATION

1.2.1 The following Available Project Information documents are available from Construction Manager upon request from Subcontractor Bidder:

1.2.1.1 Risk Management Plan prepared by Stantec
1.2.1.2 Phase II Environmental Site Assessment prepared by Stantec
1.2.1.3 Wind Study prepared by Entuitive
1.2.1.4 Additional Available Project Information that may become available during Bidding Period not issued to Bidders with Bid Documents will be available for examination at Construction Manager’s office location listed in Instructions to Bidders
1.2.1.5 Bidders may examine above Available Project Information during normal office hours, 8:00 AM to 5:00 PM daily.
1.2.1.6 Direct inquiries during Bid period to person identified by Construction Manager in Instructions to Bidders to receive inquiries.

1.3 RELATED REQUIREMENTS

1.3.1 Section 01 35 31 – LEED® Special Project Procedures: Sustainable Site Development LEED® prerequisite requirements.
1.3.2 Section 01 50 00 – Temporary Facilities and Controls
1.3.3 Division 31 – Common Work Results for Earthwork: Protection of soil stockpiles from erosion, wind and compaction; water control methods for open excavations.
1.3.4 Division 31 – Soil Stripping and Stockpiling: Protection of soil stockpiles from erosions, wind and compaction.
1.3.5 Division 31 – Excavation Support and Protection: Water control methods for open excavations.

1.4 REFERENCE STANDARDS

1.4.1 Environmental Protection Agency (EPA):

1.4.1.1 2003 US EPA Construction General Permit
1.5 SUBMITTALS

1.5.1 Provide required information in accordance with Section 01 33 00 – Submittal Procedures.

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

1.5.2.1 Storm Water Pollution Prevention Plan (SWPPP): Submit SWPPP indicating methods, plans and details for control of erosion and sedimentation including the following:
   1.5.2.1.1 Identification of SWPPP coordinator with a description of duties
   1.5.2.1.2 Identification of storm water pollution prevention team that will assist in implementation of the SWPPP during construction
   1.5.2.1.3 Description of existing site conditions including the following:
      - Existing land use of the site; such as wooded areas, open grassed areas, pavement, buildings and similar structures
      - Soil types at the site
      - Location of surface waters that are located on or next to the site such as wetlands, streams, rivers, lakes, ponds and similar site features
   1.5.2.1.4 Identification of water bodies that will receive runoff from the construction site including the ultimate body of water that receives the storm water
   1.5.2.1.5 Identification of drainage areas and potential storm water contaminants
   1.5.2.1.6 Description of storm water management controls and various Best Management Practices (BMP's) necessary to reduce erosion, sediment and pollutants in storm water discharge
   1.5.2.1.7 Description of the facility monitoring plan and how controls will be coordinated with construction activities
   1.5.2.1.8 Description of equipment and materials proposed for waste water management
   1.5.2.1.9 Description of the implementation schedule and provisions for amendment of the plan
   1.5.2.1.10 Inspection logs; sample logs are appended to the end of this Section

1.5.2.2 Sedimentation Control Plan: Submit drawings indicating arrangement and location of erosion and dust control measures; methods for maintaining, cleaning and repairing erosion and dust control measures, and product data indicating actual materials used for erosion and dust controls including the following:
   1.5.2.2.1 Measures used to prevent soil loss by storm water runoff and wind erosion
   1.5.2.2.2 Measures used to protect soil stockpiles and berms
   1.5.2.2.3 Measures used to prevent sedimentation of storm sewers
   1.5.2.2.4 Measures used to prevent pollution arising from dust and particulate matter
1.5.2.3 Photographs: Submit sufficiently detailed photographs indicating sediment and erosion control measures as they are established during the course of the Work.

1.6 QUALITY ASSURANCE

1.6.1 Regulatory Requirements: Protect storm sewers and roadways in accordance with Local Municipal Ordinances; protect waterways and ground water in accordance with Authority Having Jurisdiction.

2 Products

2.1 MATERIALS

2.1.1 Erosion and Dust Control Polymer: Polymer based, biodegradable, non-dissipating, non-leaching, non-tracking soil stabilizer and dust control agent that binds soil particles; specifically manufactured for maximum bonding to clay soil particles to decrease erosion potential of exposed earth excavations:

2.1.1.1 Application Equipment: Hydroseeding equipment is acceptable for purpose of this specification.

2.1.1.2 Acceptable Materials:
  2.1.1.2.1 Watersorb, PAM
  2.1.1.2.2 Soilworks, Gorilla Snot

2.1.2 Steep Slope Erosion Control: Biodegradable geotextile erosion control blanket suitable for medium to steep slope applications designed for installation in accordance with Erosion Control Technology Council selection criteria; with biodegradable anchors and weights to prevent blow off and to maintain good soil contact:

2.1.2.1 Acceptable Materials:
  2.1.2.1.1 American Excelsior Co., AEC Premier Straw/Coconut
  2.1.2.1.2 Erosion Control Blanket, SC32 ECB
  2.1.2.1.3 North American Green SC150 Erosion Control Blanket

2.1.3 Dust Control Windbreaks: Geotextile fabric attached to snow or site fencing with fence posts and tie wires.

2.1.4 Sediment Traps: Geotextile filter fabric, straw bales or other acceptable filtration or silt fence materials held in place with and bound to hardwood stakes.

2.1.5 Storm Drain Inlet Protection: Permeable plastic berm designed specifically for erosion and sediment control with erosion control blanket and to reduce water velocity and trap sediment:

2.1.5.1 Basis-of-Design Materials: Nilex, Geo-Ridge System

3 Execution

3.1 PREPARATION

3.1.1 Prepare a site specific sedimentation control plan using reference standards as the basis of information; include additional municipal requirements that are in excess of the minimum standards established by the listed reference standards.
3.2 INSTALLATION

3.2.1 Provide temporary erosion and sedimentation control measures to prevent soil erosion and discharge of soil bearing water runoff or airborne dust to adjacent properties, roadways and walkways in accordance with requirements of Authority Having Jurisdiction and as indicated in sedimentation control plan.

3.2.2 Inspect, repair, and maintain erosion and sedimentation control measures during construction until permanent vegetation is established.

3.2.3 Remove construction activity pollution control, and restore and stabilize areas disturbed during removal.

3.2.4 Gravel Traps:

3.2.4.1 Utilize gravel traps at the site gates and hard surface access roads on-site.

3.2.4.2 Use street cleaning equipment on regular basis to sweep the streets.

3.2.5 Sedimentation Control Basins, Silt Fences and Erosion Control Blankets:

3.2.5.1 Establish a sedimentation pond of sufficient size or geotextile filtering system to control sedimentation from entering surface drainage or street drainage and sewerage systems

3.2.5.2 Regularly remove accumulations of silt and dispose off-site at a recognized landfill facility

3.2.5.3 Reapply erosion control polymer as it biodegrades or is worn away from construction activities

3.2.5.4 Repair silt fences and erosion control blankets when torn; securely attach fabric to posts; firmly embed posts into ground

3.2.5.5 Weigh and peg erosion control blankets so that blankets are in full contact with ground; spaces and gaps under blankets will result in increased erosion rendering this measure ineffective

3.2.6 Stabilized Construction Entrance:

3.2.6.1 Establish a clean gravel pad at construction entrances of sufficient length and depth to trap clay and excavation debris

3.2.6.2 Clean gravel on a regular basis to prevent build-up of clay and prevent sediment from being tracked onto roadways.

3.2.7 Best Management Practices: includes the following:

3.2.7.1 Employee Training:

3.2.7.1.1 Implement an employee training program educating personnel about the requirements of the sedimentation control plan and SWPPP.

3.2.7.1.2 Include a description of the theory and goals of the sedimentation control plan and SWPPP.

3.2.7.1.3 Provide hands-on training of erosion controls, equipment fuelling, spill prevention and response, good housekeeping protocols, material handling, and waste material handling before their first day on site.
3.2.7.2 Housekeeping:

3.2.7.2.1 Monitor vehicles for leaks and repair where leakage of polluting liquids are observed; liquids include, but are not limited to: gasoline, oil, diesel fuel, anti-freeze, brake or transmission fluid or other substance that may be harmful if released into the environment or storm drainage systems.

3.2.7.2.2 Store petroleum products in clearly labelled sealed containers; provide spill kits at fuelling and maintenance areas; provide impermeable tarp at fuelling and maintenance areas.

3.2.7.2.3 Provide a covered hopper or collection skid for waste materials.

3.2.7.2.4 Tightly seal and store paint containers and sealing or curing compounds when not required and store in a protected location; do not discharge excess materials into storm drainage system.

3.2.7.2.5 Do not allow concrete trucks to washout, or discharge surplus concrete or drum wash water on site; dispose of at recognized disposal facility.

3.2.7.2.6 Place absorbent materials to soak up excess form release agents; replace absorbent materials when they become saturated at a recognized disposal facility.

3.2.7.3 Inspection and Maintenance:

3.2.7.3.1 Regular inspections and maintenance are essential to the effectiveness of construction site storm water control, erosion and sedimentation structures:

- Routine Inspection and Maintenance: Includes for weekly checks to prevent potential nuisance situations (odours, mosquitoes and weeds) and identifies that structures are in good working and are repaired or replaced as required; routine maintenance reduces the possibility of polluting storm runoff by finding and correcting problems before a rain incident.
- Non-Routine Inspection and Maintenance (Repair): Includes any inspection or maintenance that is not performed on a regular basis arising from unplanned incidents including the following:
  * Major repairs after a violent storm or extended rainfall
  * Replacement and redesign of control structures
  * Accidental displacement or demolition of control structures arising from site activities
  * Replacement of worn out or degraded materials (many materials are biodegradable)

3.2.7.3.2 Document each inspection and maintenance performed and make notation of ongoing activities in a daily log; make logs available to Consultant for review when requested; maintain permanent file of logs until final acceptance of project requirements.

END OF SECTION
1 General

1.1 SUMMARY

1.1.1 Work in this Section includes, but is not limited to, requirements for Construction Waste Management during construction, which forms the Construction Manager’s commitment to reduce and divert waste materials from landfill as follows:

1.1.1.1 Waste Audit that tracks the success of the waste management plan against actual waste diversion from landfill
1.1.1.2 Waste Management Plan that provides guidance on a logical progression of tasks and procedures to be followed in a pollution prevention program to reduce or eliminate the generation of waste, the loss of natural resources, and process emissions through source reduction, reuse, recycling, and reclamation.
1.1.1.3 Monthly Progress Reports indicating cumulative totals representing progress towards achieving a minimum of 75% diversion of waste materials from landfill
1.1.1.4 Identifying any special programs, landfill options or alternatives to landfill

1.1.2 This Section includes guidelines and recommendations for developing the Construction Manager prepared waste management plan and reporting procedures required for LEED® MR Credit 2 – Construction Waste Management. Owner has established that this Project shall generate the least amount of waste possible and that processes that ensure the generation of as little waste as possible due to error, poor planning, breakage, mishandling, contamination, or other factors be employed by the Construction Manager.

1.1.3 Owner recognizes that waste in any project is inevitable, but indicates that as much of the waste materials as economically feasible shall be reused, salvaged, or recycled in order to divert materials away from landfill.

1.2 RELATED REQUIREMENTS

1.2.1 Section 01 35 31 – LEED® Special Project Procedures: Sustainable Site Development LEED® prerequisite requirements.

1.2.2 Section 01 50 00 – Temporary Facilities and Controls

1.3 DEFINITIONS

1.3.1 Clean Waste: Untreated and unpainted; not contaminated with oils, solvents, sealants or similar materials.

1.3.2 Construction Waste: Solid wastes typically including but not limited to, building materials, packaging, trash, debris, and rubble resulting from construction, re-modeling, repair and demolition operations.

1.3.3 Hazardous: Exhibiting the characteristics of hazardous substances including, but not limited to, ignitability, corrosiveness, toxicity or reactivity.

1.3.4 Non-hazardous: Exhibiting none of the characteristics of hazardous substances, including, but not limited to, ignitability, corrosiveness, toxicity, or reactivity.

1.3.5 Non-toxic: Neither immediately poisonous to humans nor poisonous after a long period of exposure.
1.3.6 Recyclable: The ability of a product or material to be recovered at the end of its life cycle and remanufactured into a new product for reuse by others.

1.3.7 Recycle: To remove a waste material from the Project site to another site for remanufacture into a new product for reuse by others.

1.3.8 Recycling: The process of sorting, cleansing, treating and reconstituting solid waste and other discarded materials for the purpose of using the altered form. Recycling does not include burning, incinerating, or thermally destroying waste.

1.3.9 Return: To give back reusable items or unused products to vendors for credit.

1.3.10 Reuse: To reuse a construction waste material in some manner on the Project site.

1.3.11 Salvage: To remove a waste material from the Project site to another site for resale or reuse by others.

1.3.12 Sediment: Soil and other debris that has been eroded and transported by storm or well production run-off water.

1.3.13 Source Separation: The act of keeping different types of waste materials separate beginning from the first time they become waste.

1.3.14 Toxic: Poisonous to humans either immediately or after a long period of exposure.

1.3.15 Trash: Any product or material unable to be reused, returned, recycled, or salvaged.

1.3.16 Volatile Organic Compounds (VOC's): Chemical compounds common in and emitted by many building products over time through outgassing:

1.3.16.1 Solvents in paints and other coatings;
1.3.16.2 Wood preservatives; strippers and household cleaners;
1.3.16.3 Adhesives in particleboard, fibreboard, and some plywood; and foam insulation.
1.3.16.4 When released, VOC’s can contribute to the formation of smog and can cause respiratory tract problems, headaches, eye irritations, nausea, damage to the liver, kidneys, and central nervous system, and possibly cancer.

1.3.17 Waste: Extra material or material that has reached the end of its useful life in its intended use. Waste includes salvageable, returnable, recyclable, and reusable material.

1.3.18 Waste Management Plan: A project related plan for the collection, transportation, and disposal of the waste generated at the construction site; the purpose of the plan is to ultimately reduce the amount of material being landfilled.

1.4 REFERENCE STANDARDS

1.4.1 American Society for Testing and Materials (ASTM):

1.4.1.1 ASTM E1609-01, Standard Guide for Development and Implementation of a Pollution Prevention Program
1.5 ADMINISTRATIVE REQUIREMENTS

1.5.1 Coordination: Coordinate waste management requirements with all Divisions of the Work for the project, and ensure that requirements of the Waste Management Plan are followed.

1.5.2 Preconstruction Meeting: Arrange a preconstruction meeting in accordance with Section 01 31 19 – Project Meetings before starting any Work of the Contract attended by the Owner, Construction Manager, affected Trade Contractor’s and Consultant to discuss the Construction Manager’s Waste Management Plan and to develop mutual understanding of the requirements for a consistent policy towards waste reduction and recycling.

1.6 SUBMITTALS

1.6.1 Provide required information in accordance with Section 01 33 00 – Submittal Procedures.

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

1.6.2.1 Waste Management Audit (WMA): Prepare a preliminary analysis of material types and projected amounts being generated on site during construction and propose alternative waste disposal methods designed to minimize disposal in landfills to meet LEED® MR Credit 2 requirement to divert 75% by weight of total project solid waste from landfill, and submit to the Consultant within ten (10) days after receipt of Notice of Award of Bid; Consultant will review and provide commentary before development of Construction Manager’s Waste Management Plan.

1.6.2.2 Waste Management Plan (WMP): Submit a Waste Management Plan for this Project prior to any waste removal from site; WMP shall contain; but not be limited to, the following:

1.6.2.2.1 Analysis of the proposed jobsite waste being generated, including types and quantities.

1.6.2.2.2 A listing of alternatives to landfill for each material proposed to be salvaged, reused, recycled or composted during the course of the Project, the proposed local market for each material, and the estimated net cost savings or additional costs resulting from separating and recycling versus landfill each material; "Net" means that the following have been subtracted from the cost of separating and recycling:

- Revenue from the sale of recycled or salvaged materials, and
- Landfill tipping fees saved due to diversion of materials from the landfill. The list of these materials is to include, at minimum, the following materials:

  ∞ Paper
    ∗ Bond.
    ∗ Newsprint
    ∗ Cardboard and paper packaging materials

  ∞ Clean dimensional wood

  ∞ Beverage containers

  ∞ Land clearing debris

  ∞ Concrete

  ∞ Bricks
Concrete Masonry Units (CMU)
Asphalt
Metals from banding, steel stud trim, ductwork, piping, rebar, roofing, other trim, steel, iron, galvanized sheet steel, stainless steel, aluminum, copper, zinc, lead, brass, and bronze
Gypsum board (wood, nails and staples allowed)
Glass, coloured glass allowed
Plastic buckets; waste can be reduced by using plastic lined cardboard dry packed materials instead of premixed moist packed materials where this option is available
Carpet and carpet pad trim
Paint and paint cans
Plastic sheeting and packaging, where recycling programs are available
Insulation

1.6.2.2.3 Identify materials that cannot be recycled, reused or composted; provide explanation or justification.

1.6.2.2.4 Landfill options: The name of the landfill where trash will be disposed of, the applicable landfill tipping fees, and the projected cost of disposing of all Project waste in the landfill.

1.6.2.2.5 Materials Handling Procedures: A description of the means by which any waste materials will be protected from contamination, and a description of the means to be employed in recycling the above materials consistent with requirements for acceptance by designated facilities.

1.6.2.2.6 Transportation: A description of the means of transportation of the recyclable materials, whether materials will be site separated and self hauled to designated centres, or whether mixed materials will be collected by a waste hauler and removed from the site, and destination of materials.

1.6.3 Resources for Development of Waste Management Plan: The following sources may be useful in developing the Draft Waste Management Plan:

1.6.3.1 Recycling Haulers and Markets: Investigate local haulers and markets for recyclable materials, and incorporate into Waste Management Plan

2 Products

2.1 NOT USED

3 Execution

3.1 WASTE MANAGEMENT PLAN IMPLEMENTATION

3.1.1 Manager: Construction Manager will designate an on-site party (or parties) responsible for instructing workers and overseeing and documenting results of the Waste Management Plan for the Project.

3.1.2 Distribution: Construction Manager will distribute copies of the Waste Management Plan to the Job Site Foreman, each Trade Contractor, the Owner, and the Consultant.
3.1.3 Instruction: Construction Manager will provide on-site instruction of appropriate separation, handling, and recycling, salvage, reuse, composting and return methods to be used by all parties at the appropriate stages of the Project.

3.1.4 Separation facilities: Due to limited space, Construction Manager will provide one (1) waste bin on-site, and utilize waste removal company to sort waste materials off-site. Waste removal company shall provide documentation to Construction Manager in accordance with LEED requirements.

3.1.5 Hazardous wastes: Hazardous wastes shall be separated, stored, and disposed of according to local regulations.

3.1.6 Application for Progress Payments: Construction Manager will submit with each Application for Progress Payment a Summary of Waste Generated by the Project:

3.1.6.1 Failure to submit this information shall render the Application for Payment incomplete and shall delay Progress Payment.

3.1.6.2 The Summary shall be submitted on a form acceptable to the Owner and shall contain the following information:

   3.1.6.2.1 The amount in tonnes or m³ (tons or cubic yards) of material land filled from the Project,
   3.1.6.2.2 The identity of the landfill, the total amount of tipping fees paid at the landfill, and
   3.1.6.2.3 The total disposal cost. Include manifests, weight tickets, receipt, and invoices.

3.1.6.3 For each material recycled, reused, composted or salvaged from the Project, the amount tonnes or m³ (tons or cubic metres), the date removed from the jobsite, the receiving party, the transportation cost, the amount of any money paid or received for the recycled or salvaged material, and the net total cost or savings of salvage or recycling each material.

3.1.6.4 Attach manifests, weight tickets, receipts, and invoices.

3.2 TRADE CONTRACTOR’S RESPONSIBILITY

3.2.1 Trade Contractors shall cooperate fully with the Construction Manager to implement the Waste Reduction Plan.

3.2.2 Failure to cooperate may result in the Owner not achieving their environmental goal requirements for LEED® Certification, and may result in recovery of costs being assessed by the Construction Manager to the responsible Trade Contractors.

3.3 SPECIAL PROGRAMS

3.3.1 Construction Manager will be responsible for final implementation of programs involving tax credits or rebates or similar incentives related to recycling, if applicable to the Project.

3.3.2 Revenues or other savings obtained for recycling or returns shall accrue to the Construction Manager.

3.3.3 Construction Manager is responsible for obtaining information packets relevant to all of the above listed programs prior to starting work on the Project, and confirming the facilities ability to accept waste from the Project.
3.3.4 Construction Manager will document work methods, recycled materials, alternate disposal methods that qualify for tax credits, rebates, and other savings under programs listed by Alberta Environment.

3.4 SOLID WASTE MANAGEMENT

3.4.1 Collection: Implement a recycling/reuse program that include separate collection of waste materials of the following types as appropriate to the project waste and to the available recycling and reuse programs in the project area.

3.4.2 Recycling/Reuse: Maximize recycling and reuse of materials:

3.4.2.1 Recycling/Reuse off Project Site: Collect materials for recycling and reuse off project site, coordinate potential reuse facilities through the following:

3.4.2.1.1 Alberta Environment Construction, Renovation and Demolition Waste Reduction at http://www3.gov.ab.ca/env/.

3.4.2.1.2 Habitat for Humanity, sites requiring donated materials vary, contact the national hotline (800) 667-5137 or http://www.habitat.ca/.

3.5 HANDLING

3.5.1 Clean materials that are contaminated before placing in collection containers.

3.5.2 Deliver materials free of dirt, adhesives, solvents, petroleum contamination, and other substances deleterious to recycling process.

3.5.3 Arrange for collection by or delivery to the appropriate recycling or reuse facility.

3.5.4 Hazardous Waste and Hazardous Materials: Handle in accordance with applicable regulations.
3.6 SAMPLE CONSTRUCTION WASTE MANAGEMENT FORMS

3.6.1 Following example forms can be used by the Construction Manager to establish their own forms for recording management of construction waste:

### Construction Waste Reduction and Management Plan

<table>
<thead>
<tr>
<th>Name of Company:</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Project Name and Location:</td>
<td></td>
</tr>
<tr>
<td>Project Type:</td>
<td>☐ Construction ☐ Renovation ☐ Demolition</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Material</th>
<th>Total Estimated Generation (m³ or tonnes)</th>
<th>Proposed Quantity (m³ or tonnes)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Reuse/Resale</td>
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<td></td>
</tr>
</tbody>
</table>

| Totals |  |  |  |  |

<table>
<thead>
<tr>
<th>Contact Name/Title/Phone Number</th>
<th>Signature/Date</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Example Form 1
## Waste Management Plan

<table>
<thead>
<tr>
<th>Name of Company:</th>
<th>Contact Person and Telephone Number:</th>
</tr>
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<tbody>
<tr>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Project Name and Location:</th>
<th>Project Size (m²)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Project Type:</th>
<th>Construction</th>
<th>Renovation</th>
<th>Demolition</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### Pre-Project

<table>
<thead>
<tr>
<th>Material</th>
<th>Estimated Generation</th>
<th>Recycled/Salvaged/Disposed</th>
<th>Facility</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### Project Updates

For Period: ____________ to ____________

---

**Explanatory Notes:**

- **Material:** Enter materials targeted for recycling or salvage, and include a category for waste materials requiring disposal.
- **Estimated Generation:** Enter estimated volumes (in m³) or quantities (in tonnes) of recyclable and waste materials generated, and state number of salvageable items.
- **Recycled/Salvaged/Disposed:** Enter actual volumes (in m³) or quantities (in tonnes) of recyclable and waste materials generated, and state number of salvageable items.
- **Facility:** Enter end destination address or location of recycled, salvaged and disposed materials.

---

**Example Form 2**

**END OF SECTION**
1 General

1.1 SUMMARY

1.1.1 Work in this Section includes, but is not limited to, requirements for Indoor Air Quality (IAQ) Management during construction, which forms the Construction Manager’s commitment for maintaining indoor air quality during construction and prior to building occupancy and promote the comfort and well-being of construction workers and building occupants.

1.1.2 This Section includes guidelines and recommendations for developing the Construction Manager prepared Indoor Air Quality Management Plan during Construction as required by LEED® Credit IEQ 3.1.

1.2 RELATED REQUIREMENTS

1.2.1 Section 01 35 31 – LEED® Special Project Procedures: Sustainable Site Development LEED® prerequisite requirements.

1.2.2 Section 01 50 00 – Temporary Facilities and Controls

1.3 DEFINITIONS

1.3.1 Definitions listed in this Section are applicable to products having the potential to meet environmental requirements for sustainable building practices and are based on defined terms contained in ASTM E2114.

1.3.2 Adequate Ventilation: Ventilation, including air circulation and air changes, required to cure materials, dissipate humidity, and prevent accumulation of dust fumes, vapours, or gases.

1.3.3 Environmental Pollution and Damage: The presence of chemical, physical, or biological elements or agents which adversely affect human health or welfare; unfavourably alter ecological balances; or degrade the utility of the environment for aesthetic, cultural, or historical purposes.

1.3.4 Hazardous Materials: Any material that is regulated as a hazardous material in accordance with 49 CFR 173 requires a Material Safety Data Sheet (MSDS) in accordance with 29 CFR 1910.1200 or which during end use, treatment, handling, storage, transportation or disposal meets or has components which meet or have the potential to meet the definition of a Hazardous Waste in accordance with 40 CFR 261:

1.3.4.1 Hazardous materials include chemicals, pesticides, biocides, and carcinogens listed by recognized authorities, such as the Environmental Protection Agency (EPA) and the International Agency for Research on Cancer (IARC).

1.3.5 Indoor Air Quality (IAQ): The composition and characteristics of the air in an enclosed space that affect the occupants of that space. The indoor air quality of a space refers to the relative quality of air in a building with respect to contaminants and hazards and is determined by the level of indoor air pollution and other characteristics of the air, including those that impact thermal comfort such as air temperature, relative humidity and air speed.

1.3.6 Interior Final Finishes: Materials and products that will be exposed at interior, occupied spaces; including flooring, wall covering, finish carpentry, and ceilings.
1.3.7 Packaged Dry Products: Materials and products that are installed in dry form and are delivered to the site in manufacturer’s packaging, including carpets, resilient flooring, ceiling tiles, and insulation.

1.3.8 Wet Products: Materials and products installed in wet form, including paints, sealants, adhesives, and special coatings.

1.4 REFERENCE STANDARDS

1.4.1 American Society of Heating, Refrigerating and Air-Conditioning Engineers, Inc. (ASHRAE):

1.4.1.1 ANSI/ASHRAE 52.2-1999 Method of Testing General Ventilation Air-Cleaning Devices for Removal Efficiency by Particle Size, with errata but without addenda

1.4.2 American Society for Testing and Materials (ASTM):

1.4.2.1 ASTM D5116-06 Standard Guide for Small-Scale Environmental Chamber Determinations of Organic Emissions From Indoor Materials/Products.

1.4.2.2 ASTM D6245-98 (2002) Standard Guide for Using Indoor Carbon Dioxide Concentrations to Evaluate Indoor Air Quality and Ventilation


1.4.2.5 ASTM D6670-01 (2007) Standard Practice for Full-Scale Chamber Determination of Volatile Organic Emissions from Indoor Materials/Products

1.4.2.6 ASTM E1678-02 Standard Test Method for Measuring Smoke Toxicity for Use in Fire Hazard Analysis

1.4.2.7 ASTM E2114-06a Standard Terminology for Sustainability Relative to the Performance of Buildings

1.4.3 Sheet Metal and Air Conditioning Contractors National Association (SMACNA):

1.4.3.1 SMACNA IAQ Guidelines for Occupied Buildings under Construction, Second Edition 2007, ANSI/SMACNA 008-2008 (Chapter 3)

1.5 ADMINISTRATIVE REQUIREMENTS

1.5.1 Coordination: Coordinate provision of MERV filtration media, operation of HVAC equipment and isolation of ductwork systems with Sections of Divisions 20 through 25 affected by activities of this Section.

1.5.2 Preconstruction Meeting: Arrange a preconstruction meeting in accordance with Section 01 31 19 – Project Meetings before starting any Work of the Contract attended by the Owner, Construction Manager, affected Trade Contractor’s and Consultant to discuss the Construction Manager’s proposed IAQ Management Plan and to develop mutual understanding relative to details of environmental protection.

1.5.3 Scheduling: Schedule construction operations involving application of wet products prior to installation of packaged dry products to the greatest extent possible.
1.6 SUBMITTALS

1.6.1 Provide required information in accordance with Section 01 33 00 – Submittal Procedures.

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

1.6.2.1 Product Data: Submit product data for filtration media used during construction and during operation including Minimum Efficiency Reporting Value (MERV).

1.6.3 Sustainable Design Submittals:

1.6.3.1 Construction Indoor Air Quality Management (IAQ) Plan during Construction: Submit a written IAQ Management Plan a minimum of ten (10) days before preconstruction meeting. IAQ Management Plan shall include; but not be limited to, the following:

1.6.3.1.1 Establish IAQ Management Plan on information referenced in SMACNA IAQ Guidelines for Occupied Buildings under Construction

1.6.3.1.2 Proposed methods for protection of stored and installed absorptive materials to prevent damage arising from moisture and to reduce the potential for mould and microbial growth arising from moisture contamination

1.6.3.1.3 Proposed methods and materials for use at each return air grill for air handling units used during construction

1.6.3.1.4 Proposed inspection and maintenance plan for ensuring that IAQ Management Plan is correctly implemented and maintained

1.6.3.1.5 Revise and resubmit IAQ Management Plan to account for scheduling changes and differences arising from methods and materials under the direct control of the Construction Manager and their Trade Contractors.

1.6.3.1.6 Review and acceptance of the Construction Manager’s IAQ Management Plan will not relieve the Construction Manager of responsibility for compliance with applicable environmental requirements and potential for achieving required LEED® Credit IEQ 3.1.

1.7 PROJECT CLOSEOUT SUBMISSIONS

1.7.1 Sustainable Design Closeout Documentation: Submit as constructed information in accordance with Section 01 78 39 – Project Record Documents

1.7.1.1 Submit six (6)] photographs taken at three (3) different occasions during construction along with a brief description of SMACNA approach employed, documenting implementation of IAQ management measures, such as protection of ducts and on site stored or installed absorptive materials.

1.8 QUALITY ASSURANCE

1.8.1 Inspection and Testing Lab Qualifications: Use an independent third party testing agency acceptable to the Consultant, and having a minimum of 5 years experience in performing the types of testing required by this Section.
2 Products

2.1 NOT USED

3 Execution

3.1 INDOOR AIR QUALITY (IEQ) MANAGEMENT

3.1.1 During construction, comply with SMACNA IAQ Guidelines for Occupied Buildings under Construction.

3.1.2 HVAC Protection: Isolate or shut down return side of HVAC system during construction to the greatest extent possible; provide temporary filters when ventilation system must be operational during construction.

3.1.3 Source Control: Use products that have low and zero VOC materials to the greatest extent possible whether specifically specified or not; it takes the cooperation and commitment of all project participants to ensure that products used during construction do not negatively impact indoor air quality during construction.

3.1.4 Pathway Interruption: Isolate areas of work as necessary to prevent contamination of clean or occupied spaces; provide pressure differentials, physical barriers or both to protect clean or occupied spaces, coordinate requirements with Section 01 50 00.

3.1.5 Housekeeping: Maintain project, construction materials and systems to prevent contamination of building spaces during construction, as follows:

3.1.5.1 Protect stored on-site and installed absorptive materials from moisture damage.

3.1.5.2 Provide minimum 48 hour pre-ventilation of packaged dry products prior to installation and as follows:
3.1.5.2.1 Ventilate packaged dry products at supplier’s location or other suitable secure, dry and well ventilated facility that does not form a part of the project site.
3.1.5.2.2 Remove products from packaging material and ventilate in areas free from other contaminant sources and residues.
3.1.5.2.3 Provide a temperature range of 15°C to 30°C continuously during ventilation period.
3.1.5.2.4 Do not ventilate within limits of Work unless specifically approved by Consultant.

3.1.5.3 Provide adequate ventilation during and after installation of interior wet products and interior final finishes.

3.1.5.4 Provide filtration media with a Minimum Efficiency Reporting Value (MERV) of 8 as determined by ASHRAE 52.2 for air handling equipment used during construction and prior to Owner occupancy.

END OF SECTION
1 General

1.1 SUMMARY

1.1.1 Work in this Section includes, but is not limited to, requirements for Durable Building quality control procedures during construction, which forms the Construction Manager’s commitment to durable construction practices as follows:

1.1.1.1 Construction Manager’s responsibilities for development and implementation of Quality Management Program in accordance with Durable Building requirements established by CSA S478

1.1.1.2 Construction Manager’s responsibilities to verify compliance with requirements of Quality Management Program in accordance with CSA S478

1.1.2 This Section includes guidelines and recommendations for developing the Construction Manager prepared Durable Building Quality Management Program, required for LEED® RP Credit 1 – Durable Building.

1.2 RELATED REQUIREMENTS

1.2.1 Specific reference to other technical specification sections is not made in the listing of Related Requirements since work of this Section applies to structural, building envelope materials required for the Project; and specifically excludes requirements for Mechanical and Electrical systems which are governed by Project specific commissioning requirements.

1.2.2 Section 01 31 19 – Project Meetings: Preconstruction meetings held between components of the work to encourage interaction among trades and suppliers, to identify specific design innovations and unusual construction related procedures that may be required to protect building components during construction and to confirm expectations for workmanship and aesthetic finishes.

1.2.3 Section 01 35 31 – LEED® Special Project Procedures: Sustainable Site Development LEED® prerequisite requirements.

1.2.4 Section 01 45 00 – Quality Control: Submittal requirements for Durable Building Quality Management Program (DBQMP) and coordination with other quality control and quality assurance responsibilities of the Construction Manager; construction of mock-ups and samples required to determine constructability and interfacing tolerances.

1.2.5 Section 01 78 23 – Operations and Maintenance Data: Preparation of operations and maintenance manuals incorporating installation rational of installed materials including any planned repairs or replacement schedules, and detailed maintenance instructions to assist the Owner in developing a maintenance schedule for installed materials and assemblies.

1.2.6 Section 01 78 39 – Project Record Documents: Indicating actual installation conditions including any modifications required to accommodate site conditions to assist the Owner in identifying future repair procedures and processes that may differ from manufacturer’s standard installation requirements and product data.
1.3 DEFINITIONS

1.3.1 Service Life Expectations: The referenced CSA S478 standard makes reference to Design and Predicted Service Life and accessibility of materials that will require repair or replacement during the life span of the building as follows:

1.3.1.1 Design Service Life: Design Service Life for this Project ranges between 50 and 99 years based on Owner’s requirement for building materials and assemblies will perform their required functions in the service environment without unforeseen costs for maintenance or repair during the specified service life.

1.3.1.2 Predicted Service Life: The forecasted performance of materials and assemblies based on testing information provided by manufacturers or Consultant’s experience with similar materials on previous projects.

1.3.2 Practical Service Life: The Consultant’s interpretation of “Service Life” as defined by CSA S478, and means the actual period of time during which materials and assemblies perform without unforeseen costs or disruption for maintenance and repair.

1.3.3 Application of Service Life Expectations (Example of Interpretation):

1.3.3.1 Design Service Life: Span of time that will be required before the Building requires major overhaul or repairs:

1.3.3.1.1 Only permanent components of building; such as foundations and main structural members, are expected to perform for the life of the building.

1.3.3.1.2 Moveable or removable components; such as exterior cladding, exterior weatherproofing, and other envelope components, are expected to last half of the building life with a minimum of 25 years.

1.3.3.2 Predicted Service Life: Certain roofing membranes have a Predicted Service Life of 22 to 25 years before needing repair or replacement based on information provided by manufacturers and historical data provided by the National Roofing Contractors Association.

1.3.3.3 Practical Service Life: Provided the Owner will be providing maintenance to the roofing membranes during the Predicted Service Life in accordance with manufacturer’s written instructions, there is the potential to increase the Predicted Service Life span to 30 years or more; this is the Practical Service Life, which is different than the Design Service Life for the building.

1.3.4 Repairability: The ability of constructed building materials and assemblies to allow for maintenance, repair or replacement resulting from expiration of practical service life less than the Design Service Life, or damage and premature failure without adversely affecting the durability of adjacent materials; and allowing for restoration of the component or assembly back to the requirements of the Design Service Life.

1.3.5 Durability: The ability of the materials and assemblies to perform their required functions in the service environment over a period of time without unforeseen cost for maintenance or repair; the Owner will use the Predicted Service Life to measure the expectation of Durability for materials and assemblies incorporated into the Building; materials or assemblies that fail to perform within the parameters of the Predicted Service Life be considered as a failure.
1.3.6 Categories of Failure: Consultant has designed components, selected materials and specified work results based on criteria listed in CSA S478, Table 3, with specific reference to Clauses 6.3.1 (c) and 6.3.3.

1.3.7 Building Durability Plan: The Consultant is responsible for development and implementation of a Building Durability Plan; in accordance with the principles of CSA S478, for the components within the scope of the Guideline for the construction and pre-occupancy phases of the building as followings:

1.3.7.1 Design and construct the building to ensure that the predicted service life exceeds the design service life established by CSA S478, Table 3.

1.3.7.2 Design and construct components and assemblies that have design service lives shorter than design service life of the building, so that they can be readily replaced, and use a design service life in accordance with CSA S478, Table 3 as follows:

1.3.7.2.1 High Risk Failure Category: Components and assemblies subject to Failure Categories 6, 7, and 8 must have a design service life equal to the design service life of the building.

1.3.7.2.2 Medium Risk Failure Category: Components and assemblies subject to Failure Categories 4 and 5 must have a design service life equal to at least half of the design service life of the building, with a minimum of 30 years for roofing and glazing.

1.3.7.2.3 Low Risk Failure Category: Components and assemblies subject to Failure Categories 2 and 3 must be chosen to minimize effects of loss of security or interruption of use of building.

1.3.7.2.4 Normal Failures: Components and assemblies subject to Failure Category 1 are considered normal maintenance issues such as the replacement of light bulbs, filters, adjustments and lubrication of moving parts, and other replaceable components and assemblies that have negligible effect on the use of the building.

1.3.7.3 Document effectiveness of predicted service life of chosen components or assemblies by referencing manufacturer’s studies and personal experience of effectiveness of selected components or modeling deterioration processes in accordance with CSA S478, Clauses 7.3, 7.4, or 7.5; and completing Table A1, A2 and A3.

1.3.7.4 Document elements of quality assurance activities required to show that predicted service life is achieved, following format contained in Table 1, Quality Assurance and the Building Process, of CSA S478.

1.3.7.5 Develop and document quality management program for the project that ensure the quality assurance activities are carried out, in accordance with the elements identified in CSA S478, Clause 5.3, Element of Quality Management.

1.3.8 Failure: Defined in as the loss of performance within environmental constraints and limitations established by manufacturers’ testing and provided that manufacturer’s recommended installation and maintenance procedures are followed as indicated by the onset of the following:

1.3.8.1 Collapse: Related to human safety or to loss of function of the building
1.3.8.2 Damage: Local damage related to loss of function of building components or to appearance
1.3.8.3 Displacement: Related to loss of function of building components or to appearance
1.3.8.4 Discolouration: Related to appearance of building components having and aesthetic function

1.4 REFERENCE STANDARDS

1.4.1 Canadian Standards Association (CSA):

1.4.1.1 CSA S478-95 (R2007), Guideline on Durability in Buildings

1.5 SUBMITTALS

1.5.1 Provide required information in accordance with Section 01 33 00 – Submittal Procedures.

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

1.5.2.1 Durable Building Quality Management Program (DBQMP): Submit DBQMP indicating methods and procedures for controlling quality of workmanship relating to durable building process including, but not limited to, the following:

1.5.2.1.1 Identification of Construction Manager’s DBQMP coordinator with a description of duties; Construction Manager will request Work Plan from Trade Contractors to build the DBQMP.

1.5.2.1.2 Identification of quality assurance methods necessary to ensure that workmanship during construction meets requirements indicated in the Consultant’s Durable Building Quality Management Plan and the technical specifications for the Project.

1.5.2.1.3 Identification of methods or procedures to prevent premature failure of building materials or assemblies from predicted service life of those building materials or assemblies susceptible to environmental effects.

1.5.2.1.4 Identification of constructability issues required to minimize frequency and extent of interfacing between work of different trades, and to establish allowable construction tolerance between adjacent building elements.

1.5.2.1.5 Identification of transportation, handling and storage of materials and components of assemblies to protect against damage or deterioration during the construction period; specific delivery, acceptance and handling requirements are also included in technical specifications where additional special care and protection are required.

1.6 QUALITY ASSURANCE

1.6.1 Workmanship: Workmanship for the Project will be governed by CSA S478, which requires that the Construction Manager create and implement a DBQMP before staring any Work including; but not limited to, the following:

1.6.1.1 Program for review of construction processes and products used
1.6.1.2 Sampling and testing program
1.6.1.3 Program for correction of deficiencies
1.6.1.4 Process for certification of the Work
2 Products

2.1 NOT USED

3 Execution

3.1 PREPARATION

3.1.1 Obtain and become familiar with the requirements of the Reference Standards listed in this Section; understanding the requirements for Durable Building is essential to achieving the specified requirements for the Project.

3.1.2 Actual construction means and methods should not need to be altered to achieve the specified requirements; the referenced standards require documentation of the construction process and confirmation that constructability issues are addressed as they occur.

3.1.3 Successful implementation of the requirements of CSA S478 is a joint responsibility resulting from cooperative dialogue between the Owner, Consultant and Construction Manager.

3.2 CONSULTANT’S RESPONSIBILITY

3.2.1 Building Durability Plan: Consultant has prepared a Building Durability Plan and has researched and incorporated; to the greatest extent possible, materials, building components and assemblies into Drawings and Specifications to account for Design and Predicted Service Life as required by CSA S478 as agreed upon by the Owner.

3.2.2 Application of Building Science Principles: Consultant has utilized the services of an in-house qualified building science professional or a qualified consulting building science professional to develop a Building Durability Plan.

3.2.3 Design Considerations: Consultant has based the design and detailing of the building based on existing standards and proven design where possible, and has only incorporated innovative materials where sufficient modelling or testing indicates a high likelihood of successful installation in final application.

3.2.4 Operation and Maintenance: Prepare Specifications indicating requirements for operations and maintenance submissions for inclusion in Owner’s Operation and Maintenance Manual prepared by the Construction Manager.

3.3 CONSTRUCTION MANAGER’S RESPONSIBILITY

3.3.1 Quality Control: Implement the DBQMP as a part of the Construction Manager’s quality control requirements for the Project in accordance with Section 01 45 00; Trade Contractors will be required to follow the Construction Manager’s DBQMP.

3.3.2 Correction of Deficiencies: Trade Contractors shall take responsibility for their own work and correct deficiencies when they become apparent; not necessarily when they are identified by the Consultant or Owner, and note the corrective actions taken on the Record Documents in accordance with Section 01 78 39 for detailed requirements.

3.3.3 Documentation: Submit quality control documents, test results, photographs of construction progress and reports verifying that Construction Manager’s DBQMP was successfully implemented during the construction and project takeover phases of the project.
3.3.4 Constructability: Details for the project have been prepared by the Consultant to indicate general configuration of related components and contain details that suggest possible directions for solving some of the major design requirements; these details can be developed further by the Construction Manager to enhance constructability and provide access for maintenance provided that the final installation adheres to aesthetic criteria established by the drawings and specified dimensions with all elements in planes as drawn, maintaining their relationships with all other building elements.

3.3.5 Construction: Consultant understands that Construction Manager has jurisdiction over means and methods of construction; following points are intended to present an overview of construction issues that can affect the successful outcome of the Durable Building MRc8:

3.3.5.1 Timing: Construction Manager will establish regularly scheduled meetings with Trade Contractors, suppliers and other project participants in accordance with Section 01 31 19 – Project Meetings to discuss the following:
   3.3.5.1.1 LEED familiarization
   3.3.5.1.2 Coordination of construction methods and sequence
   3.3.5.1.3 Roles that Trade Contractors have in the successful implementation of LEED project deliverables

3.3.5.2 Coordination: Construction Manager will include in their DBQMP procedures that verify a clear understanding of durable building requirement as follows:
   3.3.5.2.1 Bid Document Review: Address any unclear or unresolved issues with the Consultant before starting any work relating to those items
   3.3.5.2.2 Quality Control: Confirm any requirements for sample assemblies and mock-ups for components and materials critical to building durability
   3.3.5.2.3 Interaction between Trade Contractors: Provide sufficient meetings with Trade Contractors to:
     • Confirm their understanding of new or unusual construction procedures and design innovations for constructability
     • Obtain special construction related procedures from suppliers and fabricators
     • Verify that work of previously installed materials and assemblies is acceptable for work of subsequent material and assembly installation
   3.3.5.2.4 Protection during Construction: Coordinate requirements for proper and adequate transportation, handling and storage of materials, components and assemblies to protect them against damage or deterioration during construction; coordinate with manufacturer’s information for materials and components that require special protection

3.3.6 Commissioning: Cooperate with Owner’s commissioning agent and assist in the witnessing and verification process including; but not limited to, arranging for appropriate Trade Contractor participation.

3.3.7 Operation and Maintenance:
3.3.7.1 Prepare operations and maintenance submissions for inclusion in Owner’s Manual; refer to Section 01 78 23 for detailed requirements.

3.3.7.2 Cooperate with Owner’s commissioning agent and assist recording of verified operating parameters that Owner will require to successfully maintain and operate the building systems.

3.4 OWNER’S RESPONSIBILITY

3.4.1 Testing: Owner will arrange and pay for site testing that may be required to determine conditions on and within assemblies during construction for quality assurance purposes only; this does not relieve the Construction Manager and Trade Contractors of their responsibility for quality control testing and correction of deficiencies during construction as required by this Section, referenced standards and requirements of technical specification sections.

3.4.2 Operation and Maintenance: Implementation of operations and maintenance schedule derived from information provided by the Trade Contractors and assembled in the form of the Owner’s Manual.

3.4.3 Commissioning: Ongoing verification of operational and functional building systems required to ensure that building materials, components, systems and assemblies are performing within established tolerances during project takeover and closeout procedures, Refer to Section 01 77 00 – Closeout Procedures.

END OF SECTION
1 General

1.1 INTENT

1.1.1 It is the intention of the Construction Manager to provide and pay for temporary facilities listed in this specification section unless specifically noted otherwise as being paid for by the Trade Contractor.

1.2 SUMMARY

1.2.1 This Section includes requirements for temporary facilities and controls, including temporary utilities, support facilities, and security and protection facilities.

1.2.2 Temporary utilities provided by the Construction Manager include the following:

1.2.2.1 Sewers and drainage
1.2.2.2 Sanitary facilities
1.2.2.3 Heating and cooling facilities
1.2.2.4 Ventilation
1.2.2.5 Electric power service
1.2.2.6 General site lighting
1.2.2.7 Telephone service for the use of the Construction Manager and Consultant
1.2.2.8 Other utilities required to complete work of this Section

1.2.3 Temporary utilities provided by the Trade Contractor include the following:

1.2.3.1 Telephone
1.2.3.2 Additional heating or cooling in excess of that provided by the Construction Manager, including exterior heating
1.2.3.3 Other utilities that Trade Contractor requires to complete their work, and that are not provided by the Construction Manager

1.2.4 Support facilities provided by the Construction Manager include the following:

1.2.4.1 Temporary roads and paving
1.2.4.2 Project identification and temporary signs
1.2.4.3 Waste disposal facilities
1.2.4.4 Temporary elevator usage
1.2.4.5 Temporary stairs
1.2.4.6 Other facilities required to complete work of this Section

1.2.5 Support facilities as agreed upon by the Construction Manager and that are necessary to the Work provided by the Trade Contractor include the following:

1.2.5.1 Site offices
1.2.5.2 Storage and fabrication sheds
1.2.5.3 Construction aids and miscellaneous services and facilities

1.2.6 Security and protection facilities provided by the Construction Manager include the following:

1.2.6.1 Environmental protection
1.2.6.2 Storm water control
1.2.6.3 Tree and plant protection
1.2.6.4 Site enclosure fence
1.2.6.5 Security enclosure and lockup
1.2.6.6 Barricades, warning signs, and lights
1.2.6.7 Covered walkways
1.2.6.8 Temporary enclosures
1.2.6.9 Temporary partitions
1.2.6.10 Fire protection
1.2.6.11 Other security and protection facilities required to complete work of this Section

1.2.7 Trade Contractors are required to cooperate with the Construction Manager in maintaining temporary facilities and to ensure that problems or shortages are reported to the Construction Manager in a timely manner.

1.3 DEFINITIONS

1.3.1 Permanent Enclosure: As determined by Consultant, permanent or temporary roofing is complete, insulated, and weather tight; exterior walls are insulated and weather tight; and all openings are closed with permanent construction or substantial temporary closures.

1.4 DESIGN OF TEMPORARY FACILITIES

1.4.1 Design Requirements: Construction Manager is responsible for design and safety of temporary facilities:

1.4.1.1 Temporary facilities of such nature that engineering proficiency is required for their design to ensure safety during construction shall be designed by a professional engineer in the employ of the Construction Manager or as assigned by the Construction Manager to the responsible Trade Contractor.

1.4.1.2 Before the temporary structure is used, the engineer responsible for the design or their representative shall inspect the structure and issue a certificate stating that it has been constructed according to the design engineer’s design.

1.4.1.3 Submit certificate to Consultant as an Informational Submittal in accordance with Section 01 33 00 – Submittal Procedures.

1.4.2 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:

1.4.2.1 Notify affected Trade Contractors and coordinate placement of hoisting, lifting and moving equipment, and shoring and bracings.

1.4.2.2 Provide qualified personnel to operate and erect hoists, cranes and moving equipment, and shoring and bracing.

1.4.2.3 Provide qualified engineer where site engineering is required to inspect and supervise erection procedures.

1.4.3 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:

1.4.3.1 Notify the Consultant of engineered erection procedures for hoisting, lifting and moving equipment, and shoring and bracings.

1.4.3.2 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.
1.4.3.3 Submit risk control plan and engineered lift study to the Consultant as an Informational Submittal in accordance with Section 01 33 00 – Submittal Procedures.

1.5 USE CHARGES

1.5.1 General: Cost or use charges for temporary facilities are not chargeable to Owner or Consultant and shall be included in the Contract Sum. Allow other entities to use temporary services and facilities without cost, including, but not limited to, the following:

1.5.1.1 Owner's personnel
1.5.1.2 Consultant's personnel, including Subconsultants
1.5.1.3 Testing agencies
1.5.1.4 Personnel of authorities having jurisdiction

1.5.2 Construction Manager will pay for the following service use charges for all parties engaged in construction at Project site, with limitations as indicated in this section:

1.5.2.1 Sewer Service
1.5.2.2 Water Service
1.5.2.3 Gas Service
1.5.2.4 Electric Power Service
1.5.2.5 Wireless Internet Service

1.6 QUALITY ASSURANCE

1.6.1 Tests and Inspections: Construction Manager will arrange for authorities having jurisdiction to test and inspect each temporary utility before use installed by the Construction Manager.

1.6.2 Trade Contractors shall be responsible for obtaining and paying for certifications and permits required for temporary facilities installed by themselves.

1.7 PROJECT CONDITIONS

1.7.1 Temporary Utilities: Construction Manager will at earliest feasible time, and when acceptable to Owner, change over from use of temporary service to use of permanent service:

1.7.1.1 Temporary Use of Permanent Facilities: 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.

1.7.1.2 Construction Manager will not allow the use of permanent system for temporary heating and ventilation purposes without written permission from the Owner.

1.7.1.3 As construction progresses the Construction Manager will notify Trade Contractors of terms and conditions for use of permanent heating system as arranged by the Owner, which may include the following:

1.7.1.3.1 Use of permanent systems for temporary heating shall not modify terms of warranty at time of substantial performance.
1.7.1.3.2 Operate to prevent temporary or permanent damage.
1.7.1.3.3 Operate fans at proper resistance with filters installed.

- Change filters at regular intervals.
Operate with proper safety devices and controls installed and fully operational.
Operate systems only with treated water as specified.

1.7.1.3.4 Construction Manager will provide filter media on return and exhaust air outlets.
1.7.1.3.5 Construction Manager will thoroughly clean and overhaul, and have worn or damaged parts replaced before final inspection.
1.7.1.3.6 Construction Manager will provide an alarm indicating system failure.
1.7.1.3.7 Construction Manager shall coordinate replacement of mechanical seals, regardless of condition, with new mechanical seals where pumps are used during temporary heating.

1.7.2 Conditions of Use: The following conditions apply to use of temporary services and facilities by all parties engaged in the Work:

1.7.2.1 Trade Contractors shall keep temporary services and facilities assigned to them clean and neat.
1.7.2.2 Trade Contractors shall relocate temporary services and facilities installed by themselves as required by progress of the Work and as directed by the Construction Manager.

2 Products

2.1 MATERIALS

2.1.1 General: Provide new materials. Undamaged, previously used materials in serviceable condition may be used if approved by Consultant. Provide materials suitable for use intended.

2.2 FIRE PROTECTION

2.2.1 Construction Manager will provide hand carried, portable, ULC rated fire extinguishers in class and extinguishing agent as indicated or a combination of extinguishers of NFPA recommended classes for exposures encountered on the work site.

2.2.2 Fire extinguishers will comply with NFPA 10 and NFPA 241 for classification, extinguishing agent, and size required by location and class of fire exposure.

2.2.3 During full time of construction, while existing buildings remain occupied, maintain free unobstructed access to all sides of existing buildings for fire department vehicles. Confirm access with fire department.

2.3 SHEDS AND STORAGE

2.3.1 There is limited space available on site for the placement of sheds and enclosed storage facilities.

2.3.1.1 Construction Manager will allow a limited number of sheds and enclosed storage facilities on site, Trade Contractors shall coordinate with the Construction Manager for placement of sheds and storage facilities on site.

2.3.1.2 Trade Contractors shall schedule deliveries for immediate needs only, where storage facilities are not permitted by Construction Manager.
2.3.2 Where the Construction Manager grants permission to the Trade Contractor for placement of sheds and storage facilities, they shall:

2.3.2.1 Provide suitable and sufficient enclosed and covered spaces, with raised flooring, to protect materials and equipment subject to damage by weather or construction.

2.3.2.2 Provide sheds, as necessary, to suitably store materials and equipment needing limited protection.

2.3.2.3 Locate sheds and storage buildings so as not to interfere with construction operations as directed by the Construction Manager.

2.3.2.4 Sheds and storage buildings shall be moved or removed when directed by the Construction Manager.

2.4 SITE OFFICES

2.4.1 The Construction Manager will provide a heated and lighted site office for use of the Construction Manager and job meetings.

2.4.2 Selected Major Trade Contractors will be allowed space for heated and lighted site office for their own use. Trade Contractors shall coordinate their requirements with the Construction Manager.

2.4.3 The Construction Manager will make available power to the Trade Contractors' supplied site offices. Trade Contractor will be responsible for all costs associated with the connection and disconnection of these utilities as well as the usage costs.

2.4.4 Trade Contractor supplied site offices shall be equipped with a layout table of sufficient size for the documents for this project, and be equipped with a telephone and fax machine for communications with the Construction Manager, suppliers and the Consultants.

2.4.5 The Construction Manager will make available power to the Trade Contractor supplied site offices. Trade Contractor will be responsible for costs for their use of utilities.

2.5 SIGNS

2.5.1 Construction Manager may at his discretion allow limited space for Trade Contractor signage, subject to Owner’s discretion. All proposed signage will be reviewed by the Construction Manager prior to erection. Any signs erected without the expressed permission of the Construction Manager will be permanently removed.

2.5.2 Construction Manager will provide signs and notices for safety and instruction, graphic symbols shall conform to CAN/CSA Z321-96, Signs and Symbols for the Workplace.

2.6 PROTECTIVE BARRICADES/HOARDINGS

2.6.1 The Construction Manager will erect and maintain protective barricades/hoardings required by Owner or authority having jurisdiction and as directed by Consultant, to protect the public, adjacent properties and workmen from injury.

2.6.2 Protective barricades/hoardings will be painted in colour acceptable to the Consultant.
2.7 SCAFFOLDING

2.7.1 Trade Contractors shall provide and maintain scaffolding, ramps, ladders, swing staging, and platforms required for their own scope of work.

2.7.2 Coordinate with Construction Manager for placement and notification of other Trade Contractors.

2.8 STAIRS

2.8.1 Temporary Stairs: Construction Manager will provide temporary stairs where ladders are not adequate until permanent stairs are available.

2.9 WATER SUPPLY

2.9.1 Permanent water supply system may be used for construction requirements provided no damage occurs and warranty is not affected.

2.9.2 Water: Construction Manager will provide the following services:

2.9.2.1 Water for cleaning and mixing.

2.10 POWER SUPPLY

2.10.1 Construction Manager will arrange for maximum 120/208 volt power, suitable for operation of small powered hand tools, located at centralized power supply panels, and will maintain and pay for temporary power supply in accordance with governing regulations and ordinances.

2.10.2 The Construction Manager will provide temporary lighting as required to ensure a safe worksite. Trade Contractors requiring additional site lighting for individual tasks will be provided by the individual Trade Contractors.

2.10.3 Trade Contractors shall obtain power from main switchboard only. Take precautions to ensure that electrical disturbances are not transmitted to electrical distribution system:

2.10.3.1 Trade Contractors shall pay for, and be responsible for making connections to main switchboard, and directing power to locations required on site.

2.10.4 Electrical Outlets: Trade Contractors shall connect to Construction Manager electrical services with properly configured, NEMA polarized outlets to prevent insertion of 110 to 120 V plugs into higher voltage outlets; equipped with ground fault circuit interrupters, reset button, and pilot light.

2.10.5 Power Distribution System Circuits: Where permitted and overhead and exposed for surveillance wiring circuits not exceeding 125 VAC, 20 A rating, and lighting circuits may be non-metallic sheathed cable.

2.11 DRAINAGE

2.11.1 Construction Manager will provide for site surface drainage during the period of construction in a manner to avoid creating a nuisance to adjacent areas, and provide equipment necessary to maintain excavation dry.

2.11.2 Construction Manager will keep working and storage areas free from water that could cause damage or would interfere with Work, regardless of the cause, source, or nature of the water.
2.12 SITE TOILETS

2.12.1 Construction Manager will provide and maintain adequate temporary outside toilet facilities for use of persons working at site.

2.12.2 Toilet facilities will comply with requirements of authorities having jurisdiction.

2.12.3 Permanent fixtures within the building shall not be used by Trade Contractors, Sub-Trade Contractors, suppliers or other persons working at the site, unless specific permission is obtained in writing from the Owner and directed by the Construction Manager.

2.12.4 Construction Manager will provide separate facilities for men and women, appropriately identified.

2.12.5 Trade Contractors shall maintain the facilities assigned to them in a clean and usable condition. Construction Manager reserves the right to back charge for any damages to the site toilets on a pro-rata basis to all Trade Contractors working on the site.

2.13 HEATING

2.13.1 Construction Manager will provide temporary heating to the interior of the building should proper progress of the contract so require during cold weather. Trade Contractors shall pay all costs of installation, fuel, maintenance, operation costs, and removal of equipment for any heating required to the exterior of the building:

2.13.1.1 Temporary heating for exterior components shall be by means of safe and approved appliances and sufficient to maintain an adequate temperature where the Work is being carried out.

2.13.1.2 Vent gas fired appliances outside of work area, install combustion and make-up air from source separated from exhaust by distance required by the authorities having jurisdiction.

2.13.1.3 Coordinate placement of temporary heating units with Construction Manager to minimize risk of combustion to temporary exterior hoarding, scaffolding and materials, and the building.

2.14 HUMIDITY CONTROL

2.14.1 Notify the Construction Manager of dehumidification requirements prior to work causing excess humidity.

3 Execution

3.1 INSTALLATION, GENERAL

3.1.1 Locate facilities where they will serve Project adequately and result in minimum interference with performance of the Work. Relocate and modify facilities as required and as directed by the Construction Manager.

3.1.2 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.
3.2 TEMPORARY ACCESS

3.2.1 Construction Manager will establish access points to the site to minimize traffic disturbance on the adjacent streets. Cooperate and coordinate with the Construction Manager for site access at all times.

3.2.2 Construction Manager will construct and maintain in good, usable, all-weather condition all required temporary access to and within the construction site and when no longer required, remove such temporary construction and restore site. Where temporary access crosses drainage of waterways, construct proper culverts so as not to impede water flow.

3.2.3 Cooperate with Other Trade Contractors on this site and adjacent sites to ensure access. Obey all temporary barricades and signs.

3.3 TRADE CONTRACTOR PARKING

3.3.1 Trade Contractor shall arrange and pay for parking required by their own forces, as well as that of Sub-Trade Contractors and suppliers.

3.4 DELIVERIES AND LOADING

3.4.1 Requirements relative to loading and deliveries shall be coordinated with the Construction Manager prior to the start of the Work.

3.4.2 Trade Contractors shall deliver all materials and equipment to the Construction Manager’s designated loading area.

3.5 INSTALLATION OF SUPPORT FACILITIES

3.5.1 Locate site offices, storage sheds, sanitary facilities, and other temporary construction and support facilities as directed by the Construction Manager.

3.5.2 Maintain support facilities until near Substantial Performance. Remove before Substantial Performance. Personnel remaining after Substantial Performance will be permitted to use permanent facilities, under conditions acceptable to Owner.

3.6 OPERATION OF TEMPORARY FACILITIES

3.6.1 Supervision: Construction Manager will enforce strict discipline in the use of temporary facilities, to minimize waste and abuse, and limit availability of temporary facilities to essential and intended uses.

3.6.2 Maintenance: Trade Contractors shall assist the Construction Manager in maintaining temporary facilities assigned to them in good operating condition until removal:

3.6.2.1 Protect from damage caused by freezing temperatures and similar elements:

3.6.2.1.1 Maintain operation of temporary enclosures, heating, cooling, humidity control, ventilation, and similar facilities on a 24 hour basis where required to achieve indicated results and to avoid possibility of damage.

3.6.2.1.2 Prevent water filled piping from freezing. Maintain markers for underground lines. Protect from damage during excavation operations.
3.6.3 Temporary Facility Changeover: Except for using permanent fire protection and building heating and cooling systems as soon as available, do not change over from using temporary security and protection facilities to permanent facilities until Substantial Performance as declared by the Construction Manager.

3.7 TERMINATION AND REMOVAL

3.7.1 Do not remove any temporary facilities without authorization of the Construction Manager.

3.7.2 Termination and Removal: Remove each temporary facility when need for its service has ended, when it has been replaced by authorized use of a permanent facility, or no later than Substantial Performance. Complete or, if necessary, restore permanent construction that may have been delayed because of interference with temporary facility. Repair damaged Work, clean exposed surfaces, and replace construction that cannot be satisfactorily repaired:

3.7.2.1 Materials and facilities that constitute temporary facilities are the property of Contractor.

3.7.2.2 Clean and renovate permanent facilities used during construction period in accordance with final cleaning requirements specified in Section 01 74 23 – Final Cleaning.

END OF SECTION
1 General
   1.1 RELATED REQUIREMENTS
      1.1.1 Section 01 50 00 – Temporary Facilities and Controls
      1.1.2 Section 01 35 31 – LEED® Special Project Requirements

2 Products
   2.1 NOT USED

3 Execution
   3.1 FIRES
      3.1.1 Fires and burning of rubbish on site not permitted at any time for any reason.
   3.2 DISPOSAL OF WASTES
      3.2.1 Do not bury rubbish and waste materials on site.
      3.2.2 Do not dispose of wastes or volatile materials, such as mineral spirits, oil or paint thinner into waterways, storm or sanitary sewers, ponds or ditches.
      3.2.3 Handle, store and dispose of all hazardous wastes in compliance with authorities having jurisdiction.
   3.3 DRAINAGE
      3.3.1 Do not pump water containing suspended materials into waterways, sewer or drainage systems.
      3.3.2 Control disposal or runoff of water containing suspended materials or other harmful substances in accordance with local authority requirements.
   3.4 SITE CLEARING AND PLANT PROTECTION
      3.4.1 Protect trees and plants on site and adjacent properties where indicated.
      3.4.2 Wrap in burlap, trees and shrubs adjacent to construction work, storage areas and trucking lanes, and encase with protective wood framework from grade level to height of 2 metres.
      3.4.3 Protect roots of designated trees to dripline during excavation and site grading to prevent disturbance or damage. Avoid unnecessary traffic, dumping and storage of materials over root zones.
      3.4.4 Minimize stripping of topsoil and vegetation.
      3.4.5 Restrict tree removal to areas indicated or designated by Consultant.
3.5 NOISE CONTROL

3.5.1 Comply with City of Calgary Bylaw 5M2004s for noise control regulations:

3.5.1.1 Comply with the applicable noise control requirements of the ordinance for project work.

3.5.1.2 Copies of the noise control bylaw available from the City's Online Bylaw Library at www.calgary.ca/CA/city-clerks/Documents/Legislative-services/Bylaws/5M2004.

END OF SECTION
1 General

1.1 SUMMARY

1.1.1 This Section includes common requirements for product quality, availability, storage, handling, protection, and transportation; manufacturer's instructions; quality of the Work; and coordination and fastenings.

1.2 RELATED REQUIREMENTS

1.2.1 Section 01 42 19 – Reference Standards

1.2.2 Section 01 73 00 – Execution

1.3 REFERENCE STANDARDS

1.3.1 Canadian Construction Documents Committee (CCDC)

1.3.1.1 CCDC 17-2010, Stipulated Price Contract for Trade Contractors on Construction Management Projects.

1.3.2 Reference may be made to reference standards specific to materials required for the Project within text of each specification section; conform to these reference standards, in whole or in part as specifically requested in specifications.

1.3.3 Consultant reserves right to have such products or systems tested to prove or disprove conformance if there is question as to whether any product or system is in conformance with applicable standards.

1.3.4 Cost for testing to determine whether performance is being met by the referenced standards will be borne by Owner in event of conformance with Contract Documents or by responsible Trade Contractor in event of non-conformance.

1.3.5 Conform to latest date of issue of referenced standards in effect on date of submission of Bids except where specific date or issue is specifically noted.

1.4 COORDINATION

1.4.1 Ensure cooperation of workers in laying out Work; maintain efficient and continuous supervision.

1.4.2 Be responsible for coordination and placement of openings, sleeves and accessories.

2 Products

2.1 QUALITY OF PRODUCTS

2.1.1 Products, materials, equipment and articles incorporated into the Work shall be new, not damaged or defective, and of best quality compatible with specifications for purpose intended:

2.1.1.1 Provide evidence as to type, source and quality of products provided if requested.
2.1.2 Defective products, whenever identified prior to completion of Work, will be rejected, regardless of previous inspections. Inspection does not relieve responsibility, but is precaution against oversight or error:

2.1.2.1 Remove and replace defective products at Trade Contractor’s own expense and be responsible for delays and expenses caused by rejection.

2.1.3 Decision rests strictly with the Consultant based upon requirements of Contract Documents where any disputes arise as to quality or fitness of products.

2.1.4 Maintain uniformity of manufacture for any particular or like item throughout the Work.

2.1.5 Permanent labels, trademarks and nameplates on products are not acceptable in prominent locations, except where required for operating instructions, or when located in mechanical or electrical rooms.

2.2 AVAILABILITY OF PRODUCTS

2.2.1 Review product delivery requirements and anticipate foreseeable supply delays for any items immediately upon signing Contract:

2.2.1.1 Notify Consultant if delays in supply of products are foreseeable in order that substitutions or other remedial action may be authorized in ample time to prevent delay in performance of Work.

2.2.1.2 Failure to notify Consultant at commencement of Work where it subsequently appears that Work may be delayed as a result of foreseeable delays, Consultant reserves right to substitute more readily available products of similar character, at no increase in Contract Price or Contract Time.

2.3 STORAGE, HANDLING AND PROTECTION OF PRODUCTS

2.3.1 Handle and store products in manner to prevent damage, adulteration, deterioration and soiling and in accordance with manufacturer's instructions when applicable.

2.3.2 Store packaged or bundled products in original and undamaged condition with manufacturer's seal and labels intact. Do not remove from packaging or bundling until required in Work.

2.3.3 Store products subject to damage from weather in weatherproof enclosures.

2.3.4 Store cementitious products clear of earth or concrete floors, and away from walls.

2.3.5 Keep sand, when used for grout or mortar materials, clean and dry. Store sand on wooden platforms and cover with waterproof tarpaulins during inclement weather.

2.3.6 Store sheet materials, lumber on flat, solid supports and keep clear of ground. Slope to shed moisture.

2.3.7 Store and mix paints in heated and ventilated room. Remove oily rags and other combustible debris from site daily. Take every precaution necessary to prevent spontaneous combustion.
2.3.8 Remove and replace damaged products at own expense and as directed by Consultant.

2.3.9 Touch-up damaged factory finished surfaces as directed by Consultant; use touch-up materials to match original; do not paint over name plates.

2.4 TRANSPORTATION OF PRODUCTS

2.4.1 Pay costs of transportation of products required in performance of Work.

2.4.2 Transportation cost of products supplied by Owner will be paid for by Owner; unload, handle and store such products.

3 Execution

3.1 MANUFACTURER'S INSTRUCTIONS

3.1.1 Install or erect products in accordance with manufacturer's instructions; do not rely on labels or enclosures provided with products; obtain written instructions directly from manufacturers.

3.1.2 Notify Consultant in writing of conflicts between specifications and manufacturer's instructions so that Consultant may establish course of action.

3.1.3 Improper installation or erection of products due to failure in complying with these requirements, authorizes Consultant to require removal and reinstallation at no increase in Contract Price or Contract Time.

3.2 QUALITY OF WORKMANSHIP

3.2.1 Construct Work to highest standard, executed by workers experienced and skilled in respective duties for which they are employed; immediately notify Consultant if required Work is such as to make it impractical to produce required results.

3.2.2 Do not employ anyone unskilled in their required duties; Consultant reserves right to request dismissal from site any workers deemed incompetent or careless.

3.2.3 Decisions as to standard or fitness of quality of workmanship in cases of dispute rest solely with Consultant, whose decision is final.

3.3 CONCEALMENT

3.3.1 In finished areas, conceal pipes, ducts and wiring in floors, walls and ceilings, except where indicated otherwise.

3.3.2 Before installation, inform Consultant if there is interference. Install as directed by Consultant.

3.4 REMEDIAL WORK

3.4.1 Perform remedial work required to repair or replace parts or portions of Work identified as defective or unacceptable. Coordinate adjacent affected Work as required.

3.4.2 Perform remedial work by specialists familiar with materials affected. Perform in a manner to neither damage nor put at risk any portion of Work.
3.5 LOCATION OF FIXTURES

3.5.1 Consider location of fixtures, outlets, and mechanical and electrical items indicated as approximate.

3.5.2 Inform Consultant of conflicting installation. Install as directed.

3.6 FASTENINGS

3.6.1 Coordinate types, appearance and design of fastenings and anchors with Section 01 73 00 - Execution.

3.7 PROTECTION OF WORK IN PROGRESS

3.7.1 Prevent overloading of any part of building. Do not cut, drill or sleeve any load bearing structural member, unless specifically indicated without written approval of Consultant.

3.8 EXISTING UTILITIES

3.8.1 When breaking into or connecting to existing services or utilities, execute Work at times directed by local governing authorities, with minimum of disturbance to Work, and pedestrian and vehicular traffic.

3.8.2 Protect, relocate or maintain existing active services. When services are encountered, cap off in manner approved by authority having jurisdiction. Stake and record location of capped service.

END OF SECTION
1 General

1.1 PRODUCT OPTIONS

1.1.1 For products specified only by referenced standards and performance criteria, select any product that meets or exceeds the standard.

1.1.2 For products specified by naming “Acceptable Materials”, select any product named.

1.1.2.1 The term “Acceptable Materials” is used to specify products by trade name, manufacturer, catalogue number, model number, or similar reference.

1.1.2.2 The term “Acceptable Materials” shall be deemed to establish the standard of acceptance that the Consultant will consider appropriate for the Work.

1.1.2.3 Where a list of “Acceptable Materials” exists in the technical specification sections, any one of the specified products may be used to establish the Bid Price.

1.1.3 For products specified by naming “Basis-of-Design Materials”, use the named product. Base bid price shall not include any proposed substitution. Construction Manager may submit request for acceptance of additional Acceptable Materials in accordance with Substitutions requirements of this Section and specific submittal requirements listed in Technical Specification Sections.

1.1.4 Where the specification provides for selection of an option that is not consistent with the drawings and schedules (as in the case of a piece of equipment that differs from the equipment detailed in dimensions, service requirements, loads imposed on structures, etc.), and the Construction Manager elects to use the option that is inconsistent with the drawings and schedules, they then agree to coordinate the installation of the selected option into the Work, making such changes in the Work as may be required to accommodate the option. The Construction Manager will bear all costs and waives all claims for additional compensation for costs that subsequently become apparent arising out of the option, including costs of re-design, and preparation of drawings and details.

1.1.5 For use of products other than those specified, refer to 1.2 below.

1.2 SUBSTITUTIONS

1.2.1 Submit proposals for substitution to the Construction Manager.

1.2.2 The Construction Manager will assemble requests for Substitutions requested by Trade Contractors and submit to the Consultant for review.

1.2.3 The Consultant will review the substitute products for acceptability after the close of bids.

1.2.4 The Consultant is not obliged to accept any Proposed Substitution offered by the Trade Contractor. The Consultant reserves the right to dismiss any item with no further explanation.

1.2.5 The Proposed Substitutions will be reviewed with the Construction Manager prior to awarding Trade Contracts.

1.2.6 The completed list of substitutions must include statements of respective costs of items originally specified and proposed substitutions.
1.2.7 Consultant may consider proposal if:

1.2.7.1 Products selected by Construction Manager from those specified are not available,

1.2.7.2 Delivery date of products selected from those specified would unduly delay completion of Contract,

1.2.7.3 Different products or construction methods to those specified that are considered by the Construction Manager as performing in a manner similar to, or superior to those specified.

1.2.7.4 Verification that the substitute products can be obtained, meet the performance required for the project, and meet requirements of the Building Code.

1.2.7.5 Different products or construction methods that will result in credit to Contract Price and maintain the specified performance.

1.2.7.6 Products or construction methods that add cost to the Contract Price may be considered where additional value or life cycle cost benefits can be demonstrated for the Owner.

1.2.8 Include with Proposed Substitutions:

1.2.8.1 Complete data substantiating compliance of the proposed substitute with contract requirements.

1.2.8.2 Substitute Products, provide the following:
   1.2.8.2.1 Product identification, including manufacturer's name and address;
   1.2.8.2.2 Manufacturer's literature, including product description, performance and test data, reference standards, and limitations
   1.2.8.2.3 Comparison of properties to specified products;
   1.2.8.2.4 Samples if appearance is relevant;
   1.2.8.2.5 Names and addresses of similar projects where the product has been used.

1.2.8.3 Substitute Construction Methods, provide the following:
   1.2.8.3.1 Detailed description of the proposed method, and drawings illustrating it.
   1.2.8.3.2 Itemized comparison of proposed substitution with product or method specified.
   1.2.8.3.3 Data relating to changes in schedule.
   1.2.8.3.4 Detailed description of modifications required by proposed substitution to adjacent materials and configurations (if any).

1.2.8.4 Quotation for change in contract sum, if substitution is approved, indicated as an addition or deletion from Contract Price.

1.2.8.5 Verification that product complies with the Building Code.

1.2.8.6 Completed LEED Material Information Sheet as specified in Section 01 35 31A.

1.2.9 Should Proposed Substitution be found acceptable by the Consultant, in part or in whole, the Construction Manager shall:

1.2.9.1 Assume full responsibility and costs when substitution affects any other Work,

1.2.9.2 Pay for any design or drawing changes required by the Consultant as a result of substitution,

1.2.9.3 Ensure that drawings incorporating and coordinating aspects of affected Work bear the seal and signature of an architect or engineer registered in Province of the Work.
1.2.10 In making a proposal for substitution the Construction Manager represents:

1.2.10.1 That it has personally investigated the proposal and (unless the proposal explicitly states otherwise) determined that it performs in a similar way or is superior to the product or method specified;

1.2.10.2 That the same guaranty will be furnished as for the originally specified product or construction method;

1.2.10.3 That it will coordinate installation of the accepted substitute into the Work, making such changes in the Work as may be required to accommodate the change;

1.2.10.4 That it will bear costs and waives claims for additional compensation for costs that subsequently become apparent arising out of the substitution;

1.2.10.5 That the quotation is complete and includes related costs.

1.2.11 The Consultant reserves the right to disregard any requests for substitutions submitted after the date established for the Project Start-Up Meeting and that are not presented in with the information requested in 1.2.8 above.

1.2.12 Substitutions will not be considered that are implicit in submitted shop drawings and samples rather than formally presented proposals as described above.

1.2.13 Substitutions will not be considered which require substantial changes in the Contract Documents.

1.2.14 No substitutions will be permitted without Consultant’s written acceptance. Where substitutions are found in the Work that have not been formally accepted by the Consultant, the Construction Manager will be required to remove such products and replace with specified materials or provide a credit to the value of the contract at the Consultant’s discretion.

1.2.15 Substitutions will not be considered that arise from negligence in ordering specified product in proper advance time considering place of origin of product, normal method of delivery and manufacturers ordering requirement. In the case of the preceding, the Consultant will either select a substitute product or recommend that extraordinary delivery methods be utilized to deliver the specified product at no additional cost to the Owner.
1 General

1.1 SUMMARY

1.1.1 This Section includes requirements for measurements of permanent building elements using surveying methods for accurate placement of embedded steel assemblies forming a part of concrete formwork; erection of structural steel; and setting of permanent structural anchors and fastenings for the Project.

1.1.2 This Section includes additional requirements beyond that required for general construction layout required by Section 01 73 00 – Execution.

1.2 SUBMITTALS

1.2.1 Provide required information in accordance with Section 01 33 00 – Submittal Procedures.

1.2.2 Informational Submittals: Provide the following submittals during the course of the Work:

1.2.2.1 Statement of Supervision: Submit a signed and sealed letter on company letterhead addressed to Consultant indicating that work of this Section is conducted using personnel experienced in the type and complexity of the work required for the Project.

1.3 QUALITY ASSURANCE

1.3.1 Qualifications: Provide proof of qualifications when requested by Consultant:

1.3.1.1 Personnel: Use personnel experienced, and trained in the requirements of this section and who have experience with projects having similar complexity and extent.

2 Products

2.1 NOT USED

3 Execution

3.1 SURVEY LAYOUT

3.1.1 Construction Survey: Measure formwork and other temporary supports required for accurate placement and alignment of building components including the following:

3.1.1.1 Embedded Items and Structural Steel: Locate embedded items and structural steel; measure offsets in plan and vertical elevations referenced from fixed construction survey points.

3.1.1.2 Confirmation of Layout: Confirm construction layout immediately prior to placing concrete and during erection of structural steel; correct any deviations required to align or correct placement of components forming the permanent structure before final assembly or placement of the loose components.

END OF SECTION
1 General

1.1 SUMMARY

1.1.1 This Section includes general procedural requirements governing execution of the Work including, but not limited to, the following:

   1.1.1.1 Construction layout
   1.1.1.2 General installation of products
   1.1.1.3 Coordination of Owner installed products
   1.1.1.4 Progress cleaning
   1.1.1.5 Starting and adjusting
   1.1.1.6 Protection of installed construction
   1.1.1.7 Correction of the Work

1.1.2 This Section contains general items which apply to the entire project and are addressed to the Trade Contractor unless indicated otherwise.

1.1.3 It is the responsibility of the Construction Manager to ensure compliance by the various Trade Contractors with all applicable general requirements of the Specifications Sections contained in the Project Manual.

1.2 RELATED REQUIREMENTS

1.2.1 Section 01 31 13 – Project Coordination: Procedures for coordinating site engineering with other construction activities.

1.2.2 Section 01 31 19 – Project Meetings: Procedures for coordinating site engineering with other construction activities.

1.2.3 Section 01 33 00 – Submittal Procedures: Submission of surveys.

1.2.4 Section 01 73 29 – Cutting and Patching: Procedural requirements for cutting and patching necessary for the installation or performance of other components of the Work.

1.2.5 Section 01 74 23 – Final Cleaning

1.2.6 Section 01 75 13 – Checkout Procedures

1.2.7 Section 01 75 16 – Start-Up Procedures

1.2.8 Section 01 78 39 – Project Record Documents: Submitting final property survey, recording of Owner accepted deviations from indicated lines and levels.

1.3 ADMINISTRATIVE REQUIREMENTS

1.3.1 Hours of Work: Confine hours of Work on site from 07:00 hours to 18:00 hours, local time, Monday through Friday, and Saturdays as required, and as follows:

   1.3.1.1 Arrangements for extended hours to those stated above or for any Work required on Sundays or statutory holidays must be pre-arranged in writing with the Construction Manager’s representative.

1.3.1 Site Security: Full protection of the Work from damage is the Construction Manager’s responsibility; provide a watchman if necessary to prevent damage when the site is unoccupied.
1.4 SUBMITTALS

1.4.1 Provide required information in accordance with Section 01 33 00 – Submittal Procedures.

1.4.2 Informational Submittals: Provide the following submittals during the course of the work:

1.4.2.1 Surveyor Qualifications: Submit qualification data for land surveyor to demonstrate their capabilities and experience:

1.4.2.1.1 Include lists of completed projects with project names and addresses, names and addresses of architects and owners, and other information specified.

1.4.2.2 Certificates: Submit certificate signed by land surveyor certifying that location and elevation of improvements comply with requirements as follows:

1.4.2.2.1 Submit two (2) copies of certified survey signed by registered land surveyor.

1.4.2.2.2 Submit two (2) copies of final property survey showing the Work performed and record survey data.

1.5 QUALITY ASSURANCE

1.5.1 Qualifications: Provide proof of qualifications when requested by Consultant:

1.5.1.1 Land Surveyor Qualifications: A professional land surveyor who is legally qualified to practice in jurisdiction where Project is located and who is experienced in providing land surveying services of the kind indicated.

1.6 DELIVERY, STORAGE AND HANDLING

1.6.1 Delivery and Acceptance Requirements: Deliver materials in original wrapping or containers, with manufacturer's labels and seals intact; comply with requirements of Workplace Hazardous Materials Information System (WHMIS) as required by local Authority Having Jurisdiction, and as follows:

1.6.1.1 Time deliveries and unloading to prevent traffic congestion; do not obstruct the use of adjacent buildings.

1.6.1.2 Time deliveries to avoid interference and delays to the Construction Schedule; order material to ensure delivery when required for use:

1.6.1.2.1 Provide for continuity of supply to avoid change of supplier or materials during any phase of the Work.

1.6.1.2.2 Obtain an acceptable substitute at no extra cost to the Owner, or obtain the specified material and accept full liability for any delay in completion as directed by the Consultant where Consultant determines that delay could have been avoided by prudent scheduling and order placement.
1.6.2 Storage and Handling Requirements: Handle and store materials in accordance with manufacturer's recommendations and prevent damage, inclusion of foreign matter, rusting, staining and defects which will affect performance and appearance, and as follows:

1.6.2.1 Items having high performance factory finishes such as baked enamel, porcelain enamel or polished metal shall be adequately and continuously protected from scratches or other damage while in transit, during installation, and until Substantial Performance for the project.

1.7 SITE CONDITIONS

1.7.1 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:

1.7.1.1 Make every temporary support as strong as permanent support.
1.7.1.2 Do not place load on concrete floors until they have obtained their permanent set and Consultant's authorization has been received.

2 Products

2.1 MANUFACTURERS

2.1.1 Manufacturer's Written Directions: Comply with manufacturer's printed directions where a proprietary product is used:

2.1.1.1 Obtain written directions or instructions from manufacturer.
2.1.1.2 Do not rely on labels or directions enclosed with product.
2.1.1.3 Interpret recommended practices as directives.
2.1.1.4 Failure to comply with these requirements, or those relating to initial supervision by the manufacturer's representative, shall authorize the Consultant to require any opening up, removal and re-installation, or testing, that are considered necessary, at Trade Contractor's expense.

3 Execution

3.1 EXAMINATION

3.1.1 The existence and location of underground and other utilities and construction indicated as existing are not guaranteed; investigate and verify the existence and location of underground utilities and other construction affecting the Work prior to starting sitework:

3.1.1.1 Verify the location and invert elevation at points of connection of sanitary sewer, storm sewer, and water service piping; and underground electrical services.
3.1.1.2 Provide location data for work related to Project that must be performed by public utilities serving Project site.
3.1.2 Examine substrates, areas, and conditions, with Installer or Applicator present where indicated, for compliance with requirements for installation tolerances and other conditions affecting performance. Record observations and perform the following:

3.1.2.1 Written Report: Include the following where a written report listing conditions detrimental to performance of the Work is required by other Sections:

- 3.1.2.1.1 Description of the Work
- 3.1.2.1.2 List of detrimental conditions, including substrates
- 3.1.2.1.3 List of unacceptable installation tolerances
- 3.1.2.1.4 Recommended corrections

3.1.2.2 Verify compatibility with and suitability of substrates, including compatibility with existing finishes or primers.

3.1.2.3 Examine roughing in for mechanical and electrical systems to verify actual locations of connections before equipment and fixture installation.

3.1.2.4 Examine walls, floors, and roofs for suitable conditions where products and systems will be installed.

3.1.2.5 Proceed with installation only after unsatisfactory conditions have been corrected. Proceeding with the Work indicates acceptance of surfaces and conditions.

3.2 PREPARATION

3.2.1 Provide information to local utility that is necessary to adjust, move, or relocate existing utility structures, utility poles, lines, services, or other utility appurtenances located in or affected by construction. Coordinate with authorities having jurisdiction.

3.2.2 Take site measurements as required to fit the Work properly. Recheck measurements before installing each product. Where portions of the Work are indicated to fit to other construction, verify dimensions of other construction by site measurements before fabrication. Coordinate fabrication schedule with construction progress to avoid delaying the Work.

3.2.3 Verify space requirements and dimensions of items shown diagrammatically on Drawings.

3.2.4 Immediately on discovery of the need for clarification of the Contract Documents, submit a request for information to Consultant. Include a detailed description of problem encountered, together with recommendations for changing the Contract Documents.

3.3 CONSTRUCTION LAYOUT

3.3.1 Verify layout information shown on Drawings, in relation to the property survey and existing benchmarks; notify Consultant promptly if discrepancies are discovered:

- 3.3.1.1 Lay out the work accurately
- 3.3.1.2 Provide sufficient batter boards or monuments to preserve the main lines and levels.
- 3.3.1.3 Take measurements from survey pins and established bench marks.
- 3.3.1.4 Verify all grades, lines, levels, and site dimensions, and report any errors or inconsistencies to the Consultant.
3.3.2 Engage a land surveyor to lay out the Work using accepted surveying practices:

3.3.2.1 Establish control points to set lines and levels at each story of construction and elsewhere as needed to locate each element of Project.
3.3.2.2 Establish dimensions within tolerances indicated; do not scale Drawings to obtain required dimensions.
3.3.2.3 Inform installers of lines and levels to which they must comply.
3.3.2.4 Check the location, level and plumb, of every major element as the Work progresses.
3.3.2.5 Notify Consultant when deviations from required lines and levels exceed allowable tolerances.
3.3.2.6 Close site surveys with an error of closure equal to or less than the standard established by authorities having jurisdiction.

3.3.3 Locate and lay out site improvements, including pavements, grading, fill and topsoil placement, utility slopes, and invert elevations.

3.3.4 Locate and lay out control lines and levels for structures, building foundations, column grids, and floor levels, including those required for mechanical and electrical work:

3.3.4.1 Transfer survey markings and elevations for use with control lines and levels
3.3.4.2 Level foundations and piers from two or more locations

3.3.5 Maintain a log of layout control work:

3.3.5.1 Record deviations from required lines and levels
3.3.5.2 Include beginning and ending dates and times of surveys, weather conditions, name and duty of each survey party member, and types of instruments and tapes used
3.3.5.3 Make the log available for reference by Consultant

3.4 SITE ENGINEERING

3.4.1 Locate existing permanent benchmarks, control points, and similar reference points before beginning the Work. Preserve and protect permanent benchmarks and control points during construction operations:

3.4.1.1 Do not change or relocate existing benchmarks or control points without prior written approval of Consultant.
3.4.1.2 Report lost or destroyed permanent benchmarks or control points promptly.
3.4.1.3 Report the need to relocate permanent benchmarks or control points to Consultant before proceeding.
3.4.1.4 Replace lost or destroyed permanent benchmarks and control points promptly. Base replacements on the original survey control points.
3.4.1.5 Record benchmark locations, with horizontal and vertical data, on Project Record Documents.
3.4.1.6 Where the actual location or elevation of layout points cannot be marked, provide temporary reference points sufficient to locate the Work.
3.4.1.7 Remove temporary reference points when no longer needed. Restore marked construction to its original condition.
3.4.1.8 Provide as-built survey of piling layout and pile cut-off elevations.
3.4.2 On completion of foundation work, major site improvements, and other work requiring site engineering services, prepare a certified survey showing dimensions, locations, angles, and elevations of construction and sitework.

3.4.3 Prepare a final property survey showing significant features (real property) for Project. Include on the survey a certification, signed by land surveyor, that principal metes, bounds, lines, and levels of Project are accurately positioned as shown on the survey:

3.4.3.1 Show boundary lines, monuments, streets, site improvements and utilities, existing improvements and significant vegetation, adjoining properties, acreage, grade contours, and the distance and bearing from a site corner to a legal point.

3.4.3.2 Submit final property survey to authorities having jurisdiction as the official "property survey", as a condition of Substantial Performance.

3.5 INSTALLATION

3.5.1 Locate the Work and components of the Work accurately, in correct alignment and elevation, as indicated and as follows:

3.5.1.1 Make vertical work plumb and make horizontal work level.
3.5.1.2 Where space is limited, install components to maximize space available for maintenance and ease of removal for replacement.
3.5.1.3 Conceal pipes, ducts, and wiring in finished areas, unless indicated specifically as being exposed as architectural features:

3.5.1.3.1 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.
3.5.1.3.2 In the event of conflicts occurring between equipment shown in concealed areas, the following order of priority shall be observed:

- Structural elements
- Plumbing drains
- Sprinkler piping
- Ductwork
- Heating piping
- Plumbing piping
- Electrical conduit

3.5.1.4 Maintain minimum headroom clearance of 2440 mm in spaces without a suspended ceiling.

3.5.2 Comply with manufacturer's written instructions and recommendations for installing products in applications indicated.

3.5.3 Install products at the time and under conditions that will ensure the best possible results. Maintain conditions required for product performance until Substantial Performance.

3.5.4 Conduct construction operations so no part of the Work is subjected to damaging operations or loading in excess of that expected during normal conditions of occupancy.
3.5.5 Do not use tools or equipment that produce harmful noise levels unless appropriate Personal Protection Equipment and safety instructions to personnel have been provided:

3.5.5.1 Notify adjacent properties where tools or equipment having harmful noise levels will be in use.
3.5.5.2 Schedule use of equipment having harmful noise levels at a time that will cause the least disturbance to adjacent properties.

3.5.6 Be responsible for obtaining manufacturer's literature and for correct roughing-in and hook-up of all equipment, fixtures and appliances, as required.

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

3.5.7.1 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. Dimensions are required at rough-in stage.
3.5.7.2 Locations noted on drawings are diagrammatic only.
3.5.7.3 Note furring requirements and limitations shown on the drawings.
3.5.7.4 Make allowance for the possibility that indications and locations shown on mechanical and electrical drawings are diagrammatic.
3.5.7.5 Inform the Consultant before any masonry, concrete forming, or installation work is carried out where the Construction Manager determines that furring allowances described above cannot be obtained.

3.5.8 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.

3.6 ANCHORS AND FASTENERS

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

3.6.1.1 Prevent electrolytic action between dissimilar metals and materials.
3.6.1.2 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.
3.6.1.3 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.
3.6.1.4 Keep exposed fastenings to a minimum, space evenly and install neatly.
3.6.1.5 Fastenings which cause spalling or cracking of material to which anchorage is made are not acceptable.
3.6.1.6 Fixings to concrete decks: Do not pierce roof slabs.
3.6.1.7 Fixings to steel decks from below: Do not pierce top flutes.

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

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

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

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

3.6.4 Anchors for systems, pipes, conduits and equipment, hangers and support systems, and connections to building structure shall be the responsibility of the installing Trade Contractor; installing Trade Contractor 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:

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

3.6.5 Do not use Powder Actuated Tools 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.

3.7 CONDUIT ON ROOFS AND FLOORS

3.7.1 Electrical conduit (and other piping) shall not be run on top of roof decks or within concrete toppings of floors, except where specifically shown.

3.7.2 Inform Consultant before proceeding where drawings, specifications or job conditions are at variance with this requirement.

3.8 JOINTS

3.8.1 Make joints of uniform width. Arrange joints for the best visual effect where joint locations in exposed work are not indicated:

3.8.1.1 Obtain Consultant's acceptance of joint locations prior to final installation of materials.
3.8.1.2 Consultant retains the right to adjust location of joints to suit design criteria, provided that adjustment does not affect maximum areas recommended for materials being installed.
3.8.1.3 Fit exposed connections together to form hairline joints.

3.8.2 Do not use products, cleaners, and installation materials that are considered hazardous.

3.9 HOUSEKEEPING

3.9.1 Individual Trade Contractors will be responsible for daily housekeeping under the Construction Manager’s cleaning program. Trade Contractors will provide employees for general clean-up as directed by the Construction Manager.
3.9.2 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:

3.9.2.1 Comply with requirements in NFPA 241 for removal of combustible waste materials and debris.
3.9.2.2 Do not hold materials more than seven (7) days during normal weather or three (3) days if the temperature is expected to rise above 25°C.
3.9.2.3 Containerize hazardous and unsanitary waste materials separately from other waste. Mark containers appropriately and dispose of legally, according to regulations.

3.9.3 Maintain Project site free of waste materials and debris.

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

3.9.4.1 Remove liquid spills promptly.
3.9.4.2 Broom clean or vacuum the entire work area, as appropriate, where dust impairs proper execution of the Work.

3.9.5 Keep installed work clean. Clean installed surfaces according to written instructions of manufacturer or fabricator of product installed, using only cleaning materials specifically recommended. If specific cleaning materials are not recommended, use cleaning materials that are not hazardous to health or property, and that will not damage exposed surfaces.

3.9.6 Remove debris from concealed spaces before enclosing the space.

3.9.7 Clean exposed surfaces and protect as necessary to ensure freedom from damage and deterioration at time of Substantial Performance.

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

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

3.9.9 Burying or burning waste materials on site will not be permitted. Washing waste materials down sewers or into waterways will not be permitted.

3.9.10 Clean and protect construction in progress and adjoining materials already in place during handling and installation. Apply protective covering where required to ensure protection from damage or deterioration until Substantial Performance.

3.9.11 Clean and provide maintenance on completed construction as frequently as necessary through the remainder of the construction period. Adjust and lubricate operable components to ensure operability without damaging effects.

3.9.12 Construction Manager will supervise 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.
3.10 STARTING AND ADJUSTING

3.10.1 Coordinate requirements for starting and adjusting equipment with requirements of Mechanical and Electrical Divisions, and Sections 01 75 13 and 01 75 16. Implement a starting and adjusting program generally consisting of, but not limited to, the following:

3.10.1.1 Start equipment and operating components to confirm proper operation
3.10.1.2 Remove malfunctioning units, replace with new units, and retest
3.10.1.3 Adjust operating components for proper operation without binding
3.10.1.4 Adjust equipment for proper operation
3.10.1.5 Test each piece of equipment to verify proper operation
3.10.1.6 Test and adjust controls and safeties
3.10.1.7 Replace damaged and malfunctioning controls and equipment

3.10.2 Comply with qualification requirements in Section 01 45 00 – Quality Requirements where a factory authorized service representative is required to inspect site assembled components and equipment installation.

3.11 PROTECTION OF INSTALLED CONSTRUCTION

3.11.1 Provide final protection and maintain conditions that ensure installed Work is without damage or deterioration at time of Substantial Performance.

3.11.2 Comply with manufacturer’s written instructions for temperature and relative humidity.

3.12 CORRECTION OF THE WORK

3.12.1 Repair or remove and replace defective construction. Restore damaged substrates and finishes:

3.12.1.1 Repairing includes replacing defective parts, refinishing damaged surfaces, touching up with matching materials, and properly adjusting operating equipment.

3.12.2 Restore permanent facilities used during construction to their specified condition.

3.12.3 Remove and replace damaged surfaces that are exposed to view if surfaces cannot be repaired without visible evidence of repair.

3.12.4 Repair components that do not operate properly. Remove and replace operating components that cannot be repaired.

3.12.5 Remove and replace chipped, scratched, and broken glass or reflective surfaces.

3.13 PROTECTION

3.13.1 Adequately protect Work against possible damage. Carry out specific protection of Work when required by Consultant.

3.13.1.1 Protect from ground and rain water
3.13.1.2 Protect working surfaces from snow, ice and frost; remove snow, ice and frost where necessary for efficient progress
3.13.1.3 Protect building works and contents against climatic and weather conditions
3.13.1.4 Take all necessary precautionary measures to prevent fire
3.13.2 Any Work damaged by failure to provide protection shall be removed and replaced with new Work at the Contractor's expense.

3.13.3 Protect adjacent lanes and private property from damage during construction.

END OF SECTION
1 General

1.1 SUMMARY

1.1.1 This Section includes procedural requirements for cutting and patching required for installation of subsequent work, adjustment to installed work and repairs arising from testing and inspection.

1.2 RELATED REQUIREMENTS

1.2.1 Requirements in this Section apply to mechanical and electrical installations; refer to Mechanical and Electrical Sections for specific requirements and limitations applicable to cutting and patching individual parts of the Work, and for other requirements and limitations applicable to cutting and patching mechanical and electrical installations.

1.3 DEFINITIONS

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

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

1.4 SUBMITTALS

1.4.1 Provide required information in accordance with Section 01 33 00 – Submittal Procedures.

1.4.2 Informational Submittals: Provide the following submittals during the course of the work:

1.4.2.1 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:

1.4.2.1.1 Extent: Describe cutting and patching, show how they will be performed, and indicate why they cannot be avoided.

1.4.2.1.2 Changes to Existing Construction:

- Describe anticipated results
- Include changes to structural elements and operating components as well as changes in building’s appearance and other significant visual elements

1.4.2.1.3 Products: List products to be used and firms or entities that will perform the Work.

1.4.2.1.4 Dates: Indicate when cutting and patching will be performed.

1.4.2.1.5 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
- Indicate how long service will be disrupted
1.4.2.1.6 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.

1.4.2.1.7 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

1.5 QUALITY ASSURANCE

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

1.5.2 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 result in increased maintenance or decreased operational life or safety, including but not limited to the following:

1.5.2.1 Primary operational systems and equipment
1.5.2.2 Air or smoke barriers
1.5.2.3 Fire protection systems
1.5.2.4 Control systems
1.5.2.5 Communication systems
1.5.2.6 Conveying systems
1.5.2.7 Electrical wiring systems

1.5.3 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:

1.5.3.1 Water, moisture, or vapour barriers
1.5.3.2 Membranes and flashings
1.5.3.3 Exterior curtain wall construction
1.5.3.4 Equipment supports
1.5.3.5 Piping, ductwork, vessels, and equipment
1.5.3.6 Noise and vibration control elements and systems

1.5.4 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:

1.5.4.1 Processed concrete finishes
1.5.4.2 Masonry
1.5.4.3 Ornamental metal
1.5.4.4 Matched veneer woodwork
1.5.4.5 Preformed metal panels
1.5.4.6 Roofing
1.5.4.7 Firestopping and smoke seals
1.5.4.8 Window wall system
1.5.4.9 Stucco
1.5.4.10 Finished flooring
1.5.4.11 Finished coatings
1.5.4.12 Wall coverings
1.5.4.13 HVAC enclosures, cabinets, or covers

1.5.5 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.

1.6 WARRANTY
1.6.1 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
2.1.1 Comply with requirements specified in other Sections of the Project Manual.
2.1.2 Existing Materials: Use materials identical to existing materials. For exposed surfaces, use materials that visually match existing adjacent surfaces to the fullest extent possible:
2.1.2.1 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
3.1.1 Examine surfaces to be cut and patched and conditions under which cutting and patching are to be performed:
3.1.1.1 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.
3.1.1.2 Advise Consultant of findings before proceeding with the Work and revise penetration locations as required and directed by Consultant.
3.1.1.3 Verify compatibility with and suitability of substrates, including compatibility with existing finishes or primers before patching.
3.1.1.4 Proceed with installation only after unsafe or unsatisfactory conditions have been corrected.

3.2 PREPARATION
3.2.1 Provide temporary support of Work to be cut in accordance with Section 01 50 00 – Temporary Facilities.
3.2.2 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.

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

3.2.4 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

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

3.3.1.1 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.

3.3.2 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:

3.3.2.1 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.

3.3.2.2 Existing Finished Surfaces: Cut or drill from the exposed or finished side into concealed surfaces.

3.3.2.3 Concrete or Masonry: Cut using a cutting machine, such as an abrasive saw or a diamond core drill.

3.3.2.4 Excavating and Backfilling: Comply with requirements in applicable Division 31 Sections where required by cutting and patching operations.

3.3.2.5 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.

3.3.2.6 Proceed with patching after construction operations requiring cutting are complete.

3.3.3 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:

3.3.3.1 Inspection: Where feasible, test and inspect patched areas after completion to demonstrate integrity of installation.

3.3.3.2 Exposed Finishes: Restore exposed finishes and extend on to adjoining construction using techniques that completely hide patching and refinishing work.
3.3.3.3 Floors and Walls:

3.3.3.3.1 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.

3.3.3.3.2 Provide an even surface of uniform finish, colour, texture, and appearance.

3.3.3.3.3 Remove existing floor and wall coverings and replace with new materials, if necessary, to achieve uniform colour and appearance.

3.3.3.3.4 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.

3.3.3.4 Ceilings: Patch, repair, or re-hang existing ceilings as necessary to provide an even plane surface of uniform appearance.

3.3.3.5 Exterior Building Enclosure: Patch components in a manner that restores enclosure to a weather tight condition.

END OF SECTION
1 General

1.1 SUMMARY

1.1.1 This section includes project requirements for the following:

1.1.1.1 Waste Management Goals.
1.1.1.2 Waste Management Plan.
1.1.1.3 Management Plan Implementation.
1.1.1.4 Special Programs.

1.2 RELATED SECTIONS

1.2.1 Section 01 11 00 – Summary of Work
1.2.2 Section 01 31 19 – Project Meetings
1.2.3 Section 01 33 00 – Submittal Procedures
1.2.4 Section 01 35 31 - LEED Special Project Procedures
1.2.5 Section 01 45 00 – Quality Control
1.2.6 Section 01 50 00 – Temporary Facilities
1.2.7 Section 01 77 00 – Contract Close-out Procedures
1.2.8 In addition, all sections of the Project Manual are affected by the requirements of this Section for effective waste reduction, reuse or recycling.

1.3 DEFINITIONS

1.3.1 Clean Waste: Untreated and unpainted; not contaminated with oils, solvents, sealants or similar materials.

1.3.2 Construction and Demolition Waste: Solid wastes typically including but not limited to, building materials, packaging, trash, debris, and rubble resulting from construction, re-modeling, repair and demolition operations.

1.3.3 Hazardous: Exhibiting the characteristics of hazardous substances including, but not limited to, ignitability, corrosiveness, toxicity or reactivity.

1.3.4 Non-hazardous: Exhibiting none of the characteristics of hazardous substances, including, but not limited to, ignitability, corrosiveness, toxicity, or reactivity.

1.3.5 Non-toxic: Neither immediately poisonous to humans or the environment nor poisonous after a long period of exposure.

1.3.6 Recyclable: The ability of a product or material to be recovered at the end of its life cycle and remanufactured into a new product for reuse by others.

1.3.7 Recycle: To remove a waste material from the Project site to another site for remanufacture into a new product for reuse by others.

1.3.8 Recycling: The process of sorting, cleansing, treating and reconstituting solid waste and other discarded materials for the purpose of using the altered form. Recycling does not include burning, incinerating, or thermally destroying waste.

1.3.9 Return: To give back reusable items or unused products to vendors for credit.
1.3.10 **Reuse:** To reuse a construction waste material in some manner on the Project site.

1.3.11 **Salvage:** To remove a waste material from the Project site to another site for resale or reuse by others.

1.3.12 **Sediment:** Soil and other debris that has been eroded and transported by storm or well production run-off water.

1.3.13 **Source Separation:** The act of keeping different types of waste materials separate beginning from the first time they become waste.

1.3.14 **Toxic:** Poisonous to humans or the environment either immediately or after a long period of exposure.

1.3.15 **Trash:** Any product or material unable to be reused, returned, recycled, or salvaged.

1.3.16 **Volatile Organic Compounds (VOC’s):** Chemical compounds common in and emitted by many building products over time through off gassing:

1.3.16.1 Solvents in paints and other coatings;
1.3.16.2 Wood preservatives; strippers and household cleaners;
1.3.16.3 Adhesives in particleboard, fibreboard, and some plywood; and foam insulation.
1.3.16.4 When released, VOC’s can contribute to the formation of smog and can cause respiratory tract problems, headaches, eye irritations, nausea, damage to the liver, kidneys, and central nervous system, and possibly cancer.

1.3.17 **Waste:** Extra material or material that has reached the end of its useful life in its intended use. Waste includes salvageable, returnable, recyclable, and reusable material.

1.3.18 **Waste Management Plan:** A Project related plan for the collection, transportation, and disposal of the waste generated at the construction site. The purpose of the plan is to ultimately reduce the amount of material being landfilled.

1.4 **WASTE MANAGEMENT GOALS**

1.4.1 The Owner has established that this Project shall generate the least amount of waste possible and that processes that ensure the generation of as little waste as possible due to error, poor planning, breakage, mishandling, contamination, or other factors shall be employed.

1.4.2 The Owner recognizes that waste in any project is inevitable, but indicates that as much of the waste materials as economically feasible shall be reused, salvaged, or recycled.

1.4.3 Waste disposal in landfills shall be minimized.

1.4.4 Waste disposal by incineration of all or any waste shall be avoided. Disposal by means of giving or selling as scrap wood as fire wood is not acceptable disposal method.

1.4.5 Refer to Construction Manager’s Waste Management Plan for this Project.
1.5 WASTE MANAGEMENT PLAN IMPLEMENTATION

1.5.1 Manager: The Construction Manager shall designate an on-site party (or parties) responsible for instructing workers and overseeing and documenting results of the Waste Management Plan for the Project.

1.5.2 Distribution: The Construction Manager shall distribute copies of the Waste Management Plan to the Job Site Foreman, each Trade Contractor, the Owner, and the Consultant and LEED co-ordinator.

1.5.3 Instruction: The Construction Manager shall provide on-site instruction of appropriate handling, and recycling, salvage, reuse, and return methods to be used by all parties at the appropriate stages of the Project.

1.5.4 Hazardous wastes: Hazardous wastes shall be separated, stored, and disposed of according to local regulations.

1.6 SPECIAL PROGRAMS

1.6.1 The Construction Manager shall be responsible for final implementation of programs involving tax credits or rebates or similar incentives related to recycling, if applicable to the Project.

1.6.2 Revenues or other savings obtained for recycling or returns shall accrue to the Contractor.

1.6.3 A current listing of recyclers specializing in specific categories of materials may be obtained during normal office hours from:

- Alberta Environment
- Recycling Branch
- Recycle Info Line
- Phone: (780) 427-6982 or 1-800-463-6326

1.6.4 The Construction Manager is responsible for obtaining information packets relevant to all of the above listed programs prior to starting work on the Project.

1.6.5 The Contractor shall document work methods, recycled materials, alternate disposal methods that qualify for tax credits, rebates, and other savings under programs listed by Alberta Environment.

1.7 LEED CREDIT CONTRIBUTIONS

1.7.1 Coordinate LEED project requirements with Section 01 35 31 – LEED Special Project Procedures.

1.7.2 Provide requested items in accordance with Section 01 33 00 – Submittal Procedures.

2 Products

2.1 NOT USED

3 Execution

3.1 NOT USED.

END OF SECTION
1 General

1.1 RELATED REQUIREMENTS

1.1.1 Section 01 45 19 – Construction Waste Management and Disposal

1.1.2 Section 01 73 00 – Execution: On-going housecleaning requirements.

1.1.3 Section 01 77 00 – Contract Closeout

1.2 QUALITY CONTROL

1.2.1 Verify that cleaning agents and methods do not remove finishes and permanent protective coatings on surfaces being cleaned.

1.2.2 Employ experienced workers or professional cleaners for final cleaning. Clean each surface or unit to condition expected in an average institutional building cleaning and maintenance program.

1.2.3 Comply with manufacturer’s written cleaning instructions.

1.3 COORDINATION

1.3.1 Coordinate repair or replacement of broken or damaged materials with original installing Trade Contractors.

2 Products

2.1 CLEANING MATERIALS

2.1.1 Use only cleaning materials recommended by manufacturer of material to be cleaned.

2.1.2 Use cleaning materials only on surfaces recommended by cleaning material manufacturer.

2.1.3 Use only non-toxic cleaning materials and procedures; coordinate with Section 01 74 19; alternatives to more toxic commercial cleaning agents include; but or not limited to vinegar, citrus, borax, cornstarch, and baking soda.

3 Execution

3.1 FINAL CLEANING

3.1.1 Conduct cleaning and waste removal operations to comply with local laws and ordinances, Federal and local environmental and antipollution regulations.

3.1.2 Complete the following cleaning operations before requesting final review for acceptance of Declaration of Substantial Performance in accordance with Section 01 77 00:

3.1.2.1 Clean Project site, yard, and grounds, in areas disturbed by construction activities, including landscape development areas, of rubbish, waste material, litter, and other foreign substances.

3.1.2.2 Sweep paved areas broom clean. Remove petrochemical spills, stains, and other foreign deposits.
3.1.2.3 Rake grounds that are not planted or paved to a smooth, even textured surface.

3.1.2.4 Remove tools, construction equipment, machinery, and surplus material from Project site.

3.1.2.5 Remove snow and ice to provide safe access to building. Broom clean or remove snow and ice from all exterior paved areas designed for pedestrian or vehicular traffic, including parking areas.

3.1.2.6 Clean exposed exterior and interior hard surfaced finishes to a dirt free condition, free of stains, films, and similar foreign substances. Avoid disturbing natural weathering of exterior surfaces.

3.1.2.7 Remove debris and surface dust from limited access spaces, including roofs, plenums, shafts, trenches, equipment vaults, manholes and similar spaces.

3.1.2.8 Sweep concrete floors broom clean in unoccupied spaces.

3.1.2.9 Vacuum carpet and similar soft surfaces, removing debris and excess nap; shampoo if visible soil or stains remain.

3.1.2.10 Clean transparent materials, including mirrors and glass in doors and windows:

3.1.2.10.1 Remove glazing compounds and other noticeable, vision obscuring materials.

3.1.2.10.2 Replace chipped or broken glass and other damaged transparent materials.

3.1.2.10.3 Polish mirrors and glass, taking care not to scratch surfaces.

3.1.2.10.4 Restore reflective surfaces to their original condition.

3.1.2.11 Remove labels that are not permanent.

3.1.2.12 Remove protective films from equipment and accessories.

3.1.2.13 Touch up and otherwise repair and restore marred, exposed finishes and surfaces. Replace finishes and surfaces that cannot be satisfactorily repaired or restored or that already show evidence of repair or restoration.

3.1.2.14 Remove paint from ULC, CSA, WHI and similar labels, including mechanical and electrical nameplates.

3.1.2.15 Wipe surfaces of mechanical and electrical equipment, elevator equipment, and similar equipment. Remove excess lubrication, paint and mortar droppings, and other foreign substances.

3.1.2.16 Replace parts subject to unusual operating conditions. Restore equipment, machinery or systems used as temporary facilities to “as-new” condition so that warranties take effect at Substantial Performance.

3.1.2.17 Clean plumbing fixtures to a sanitary condition, free of stains, including stains resulting from water exposure.

3.1.2.18 Replace disposable air filters and clean permanent air filters. Clean exposed surfaces of diffusers, registers, and grills.

3.1.2.19 Clean ducts, blowers, and coils.

3.1.2.20 Clean light fixtures, lamps, globes, and reflectors to function with full efficiency. Replace burned out bulbs, and those noticeably dimmed by hours of use, and defective and noisy starters in fluorescent and mercury vapour fixtures to comply with requirements for new fixtures.

3.1.2.21 Leave Project clean and ready for occupancy.
3.1.3 Comply with safety standards for cleaning:

3.1.3.1 Do not burn waste materials.
3.1.3.2 Do not bury debris or excess materials on Owner's property.
3.1.3.3 Do not discharge volatile, harmful, or dangerous materials into drainage systems.
3.1.3.4 Remove waste materials from Project site and dispose of lawfully.

END OF SECTION
1 General

1.1 SUMMARY

1.1.1 Be responsible for starting, testing, adjusting and balancing of piped, ducted, wired and wireless services and systems including all components and equipment forming part thereof; and any other manually and mechanically operated systems including all components and equipment forming a part of the Project.

1.1.2 Perform starting of each system and each item of equipment in accordance with the general requirements specified in this section and is specific to facility start-up and commissioning of the facility.

1.1.3 This section specifies additional requirements to those required for normal Trade Contractor’s start-up of equipment and systems as contained in the General Requirements of the Contract, and as follows:

1.1.3.1 Perform and record tests to confirm proper performance and compliance with requirements of Contract Documents; take corrective action as necessary.

1.1.3.2 Perform adjustments to ensure proper, efficient and safe operation.

1.1.3.3 Perform balancing to ensure that the various parts of system are in a proper state of equilibrium.

1.1.4 A Commissioning Authority will be employed by the Owner to act on the behalf of the Owner to oversee the starting, testing, adjusting and balancing operations, and verify that equipment and systems are working as specified and within manufacturer’s operating tolerances.

1.2 RELATED REQUIREMENTS

1.2.1 Section 01 32 00 – Schedules

1.2.2 Section 01 33 55 – Start-Up Checklists

1.2.3 Section 01 75 16 – Startup Procedures

1.2.4 Division 2 through 49 Sections for specific for requirements for starting, testing, adjusting and balancing.

1.3 QUALITY ASSURANCE

1.3.1 Perform starting, testing, adjusting and balancing using qualified personnel.

1.3.2 Perform starting, testing, adjusting and balancing after starting of equipment and systems.

1.3.3 Provide personnel, operate systems at designated times and under conditions required for proper starting, testing, adjusting and balancing.

1.3.4 Report to the Consultant any deficiencies or defects noted during starting, testing, adjusting and balancing, which cannot be promptly corrected.
2 Products

2.1 MANUFACTURERS’ SITE SERVICES

2.1.1 Provide manufacturers authorized representative when specified, or when requested by the Owner at site to do the following:

2.1.1.1 Inspect, check and approve equipment and systems installation before starting.
2.1.1.2 Supervise placing equipment and systems in operation.

2.1.2 Manufacturers’ authorized representative shall provide a written report verifying that equipment:

2.1.2.1 Is properly installed and lubricated;
2.1.2.2 Is in accurate alignment;
2.1.2.3 Is free from any undue stress imposed by connecting lines or anchor bolts; and,
2.1.2.4 Is being satisfactorily operated under load conditions.

3 Execution

3.1 PREPARATION

3.1.1 Have Contract Documents, shop drawings, product data, and operation and maintenance data at hand during starting process.

3.1.2 Coordinate sequence for starting of various equipment and systems.

3.1.3 Prepare each system and item of equipment for testing, adjusting and balancing.

3.1.4 Verify that each system and equipment installation is complete and in continuous operation.

3.1.5 Verify ambient conditions.

3.2 STARTING

3.2.1 Verify that each item of equipment has been checked for proper lubrication; drive rotation, belt tension, control sequence, and other conditions affecting starting and operation; take corrective action as necessary.

3.2.2 Execute starting under supervision of Trade Contractor’s personnel and, when specified or requested by Owner, manufacturer’s authorized representative.

3.2.3 Place equipment and systems in operation in proper sequence and in accordance with approved Trade Contractor’s Start-Up sub-schedule.

3.3 TESTING, ADJUSTING AND BALANCING

3.3.1 Assign Trade Contractor responsible for installation of equipment or systems and make them accountable for testing, adjusting and balancing of all:

3.3.1.1 Piped, ducted, wired and wireless services and systems, including all components and equipment forming part thereof as identified in technical sections, and
3.3.1.2 Manually and mechanically operated systems including all components and equipment forming part thereof.
3.3.1.3 Trade Contractor shall be aware of and comply with the requirements of all CSA, ASTM, ASHRAE, IEEE and other standards affecting their portion of the work to ensure that systems installed will meet the Owner’s testing criteria.

3.3.1.4 Copies of required standards shall be kept on site during installation and be available for viewing by the Trade Contractor, the Consultant and the Owner.

3.3.2 Trade Contractor shall perform testing, adjusting and balancing using qualified personnel, or employ and pay for a qualified organization to perform such services.

3.3.3 Perform testing, adjusting and balancing after starting of equipment and systems.

3.3.4 Provide personnel, operate systems at designated times, and under conditions required for proper testing, adjusting, and balancing.

3.3.5 Report to Trade Contractor any deficiencies or defects noted during testing, adjusting and balancing, which cannot be promptly corrected.

3.3.6 Trade Contractor shall coordinate with the requirements of the Owner’s Commissioning Authority.

3.4 FINE TUNING

3.4.1 Mechanical and electrical system fine tuning by Trade Contractor shall include, but not be limited to, the following:

3.4.1.1 Air Balancing: final balancing.
3.4.1.2 Water Balancing: final balancing.
3.4.1.3 Fire Protection Systems: Verification of fire alarm system.
3.4.1.4 Electrical Equipment and Systems: Testing of safety systems and devices.
3.4.1.5 Other systems and equipment as identified in the technical sections.

3.4.2 Mechanical and Electrical Trade Contractor shall coordinate and cooperate with the Owner’s Commissioning Authority.

3.4.3 Mechanical and Electrical Trade Contractor shall make necessary adjustments to comply with standards established by the Specifications ready for Owner’s formalized verification and commissioning process.

END OF SECTION
1 General

1.1 SUMMARY

1.1.1 A facility start-up process shall be used to bring the facility to a fully operational state, free of deficiencies, in the most efficient and timely manner achievable; this process is in addition to the normal procedures for starting equipment and systems required for Declaration of Substantial Performance for the project.

1.1.2 This Section specifies the Trade Contractor’s and Owner's responsibilities during each of the following successive sub-phases of Facility Start-up:

1.1.2.1 Equipment and Systems Start-up that leads to Substantial Performance of the Work

1.1.2.2 Performance Testing will begin after declaration of Substantial Performance as described in Section 01 77 00 – Contract Closeout Procedures and will lead to Fine Tuning of equipment and systems

1.1.2.3 Fine Tuning will occur after declaration of Substantial Performance as described in Section 01 77 00 – Contract Closeout Procedures and will lead to Final Acceptance of the Work.

1.2 RELATED REQUIREMENTS

1.2.1 Section 01 33 55 – Facility Start-Up Checklists

1.2.2 Section 01 75 13 – Checkout Procedures: Starting of systems and initial testing, adjusting and balancing.

1.2.3 Section 01 77 00 – Contract Closeout Procedures: Acceptance procedures for Declaration of Substantial Performance.

1.2.4 Section 01 79 00 – Demonstration and Training

2 Products

2.1 NOT USED

3 Execution

3.1 FACILITY START-UP

3.1.1 Trade Contractor shall do the following during Facility Start-up, not necessarily in order listed:

3.1.1.1 Start equipment and systems as specified in Section 01 75 13.

3.1.1.2 Test, adjust and balance equipment and systems as specified in Section 01 75 13.

3.1.1.3 Demonstrate equipment and systems as specified in Section 01 79 00.

3.1.1.4 Complete and submit Facility Start-up report forms including:

3.1.1.4.1 Trade Contractor’s system and equipment start-up reports

3.1.1.4.2 Testing, adjusting and balancing reports

3.1.1.4.3 Manufacturers' equipment start-up reports

3.1.1.5 Review Contract Documents and inspect the Work to ensure completeness of the Work and compliance with requirements of Contract Documents.
3.1.1.6 Correct Contract Deficiencies identified as a result of the foregoing and as may be identified by the Owner.

3.1.1.7 Execute Change Orders issued by the Owner.

3.1.1.8 Perform all other work and activities required for fulfillment of prerequisites to Substantial Performance of the Work as specified in Section 01 77 00.

3.1.2 Owner will do the following during Facility Start-up.

3.1.2.1 Carry out Interim Reviews as necessary
3.1.2.2 Witness manufacturers’ equipment start-up
3.1.2.3 Verify starting, testing, adjusting and balancing by Trade Contractor
3.1.2.4 Review and approve Facility Start-up reports
3.1.2.5 Cooperate in systems and equipment demonstration and instruction.
3.1.2.6 Initiate Change Orders as required
3.1.2.7 Verify correction of Contract Deficiencies by Trade Contractor
3.1.2.8 Verify execution of Change Orders by Trade Contractor
3.1.2.9 Perform other activities related to Substantial Performance of the Work as specified in Section 01 77 00

3.1.3 The preceding requirements will be conducted in an ongoing cycle of:

3.1.3.1 Owner’s inspections
3.1.3.2 Documentation of results
3.1.3.3 Diagnosis of problems
3.1.3.4 Correction of Contract Deficiencies and execution of Change Orders as required
3.1.3.5 Verification of results

3.2 PERFORMANCE TESTING

3.2.1 Performance Testing will commence upon Substantial Performance of the Work.

3.2.2 Owner will do the following during Performance Testing:

3.2.2.1 Carry out a series of pre-planned systems and equipment operating tests under conditions simulating, to the extent possible, full and partial operating loads.
3.2.2.2 Record test results.
3.2.2.3 Diagnose problems and determine whether they are the result of Contract Deficiencies.
3.2.2.4 Initiate Change Orders as required.
3.2.2.5 Repeat tests as required following correction of Contract Deficiencies and execution of Change Orders by Trade Contractor and verify results.
3.2.2.6 Perform other activities related to Total Performance of the Work as specified in Section 01 77 00.

3.2.3 Construction Manager shall do the following during Performance Testing:

3.2.3.1 Correct Contract Deficiencies previously outstanding and those identified during Performance Testing.
3.2.3.2 Execute Change Orders issued by the Owner.

3.2.4 The preceding requirements will be conducted in an ongoing cycle of:

3.2.4.1 Performance testing
3.2.4.2 Documentation of results
3.2.4.3 Diagnosis of problems
3.2.4.4 Correction of Contract Deficiencies and execution of Change Orders as required
3.2.4.5 Verification of results

3.3 FINE TUNING

3.3.1 Fine Tuning shall commence upon Owner’s acceptance of Performance Testing results.

3.3.2 Construction Manager shall do the following during Fine Tuning:
   3.3.2.1 Correct all Contract Deficiencies previously outstanding and those identified during Fine Tuning.
   3.3.2.2 Execute Change Orders issued by Owner.
   3.3.2.3 Perform all other work and activities required for fulfillment of prerequisites to Final Acceptance of the Work as specified in Section 01 77 00.

3.3.3 Owner will do the following during Fine Tuning:
   3.3.3.1 Conduct user surveys and take environmental measurements as necessary to identify existing and potential problems.
   3.3.3.2 Initiate Change Orders as required.
   3.3.3.3 Perform other activities related to Final Acceptance of the Work as specified in Section 01 77 00.

3.4 SEASONAL CONSTRAINTS

3.4.1 Notwithstanding all inclusive requirements specified in this Section, additional separate cycles of Facility Start-up, Performance Testing and Fine Tuning may be necessitated at a later time on equipment and systems whose full operation is dependent on seasonal conditions.

3.4.2 Trade Contractor’s responsibilities with respect to such later Facility Start-up activities shall be as specified in this Section.

3.5 PARTIAL UTILIZATION OF WORK

3.5.1 Applicable requirements specified in this Section shall apply to the parts of the Work being utilized when partial utilization of the Work is required,

END OF SECTION
1 General

1.1 SUMMARY

1.1.1 This Section includes administrative and procedural requirements for contract closeout, which will be conducted in accordance with a specific take-over process as follows:

1.1.1.1 Preparation of deficiency list by Construction Manager
1.1.1.2 Preliminary review by Consultant and confirmation of deficiency list
1.1.1.3 Interim procedures:
   1.1.1.3.1 Submission of warranties
   1.1.1.3.2 Submission of record drawings
   1.1.1.3.3 Submission of operations and maintenance manuals
   1.1.1.3.4 Submission of maintenance materials and equipment
   1.1.1.3.5 Submission of certificates required by Consultant
   1.1.1.3.6 Instructions to Owner and Owners personnel
   1.1.1.3.7 Completion of final cleaning
   1.1.1.3.8 Submission of final construction photographs
   1.1.1.3.9 Submission of deficiency list indicating items completed, and items outstanding

1.1.1.4 Declaration of Substantial Performance:

1.1.1.4.1 Review and acceptance by Consultant prior to posting of Construction Manager's Declaration of Substantial Performance.
1.1.1.4.2 Submittal of Declaration of Substantial Performance in accordance with Builders Lien Act of Alberta signifying that:
   - Project is ready to be turned over to the Owner;
   - Application for Final Payment is completed; and,
   - Commencement date for warranty obligations under contract has started.

1.1.1.4.3 Administration of Lien Fund and other holdback amounts

1.2 RELATED REQUIREMENTS

1.2.1 Section 01 33 00 – Submittal Procedures
1.2.2 Section 01 35 31 – LEED® Special Project Requirements: Sustainable design closeout documentation.
1.2.3 Section 01 73 00 – Execution
1.2.4 Section 01 74 23 – Final Cleaning
1.2.5 Section 01 75 13 – Checkout Procedures
1.2.6 Section 01 75 16 – Start-up Procedures
1.2.7 Section 01 78 23 – Operation and Maintenance Data
1.2.8 Section 01 78 39 – Project Record Documents
1.2.9 Section 01 78 43 – Spare Parts
1.2.10 Section 01 79 00 – Demonstration and Training

1.2.11 Division 01 – General Commissioning Requirements

1.2.12 Division 2 through 49 Sections for specific for requirements for instruction to Owner's personnel.

1.2.13 Divisions 2 through 49 Sections for specific closeout and special cleaning requirements for products of those Sections.

2 Products

2.1 DEFICIENCY LIST

2.1.1 Construction Manager and all Trade Contractors shall conduct an inspection of the Work, identify deficiencies and defects and repair these as required to conform to the Contract Documents.

2.1.2 Prepare a list of incomplete items and submit three (3) copies 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:

2.1.2.1 Organize list of spaces in sequential order, starting with exterior areas first and proceeding from lowest floor to highest floor.

2.1.2.2 Organize items applying to each space by major element, including categories for ceiling, individual walls, floors, equipment, and building systems.

2.1.2.3 Include the following information at the top of each page:

2.1.2.3.1 Project name
2.1.2.3.2 Date
2.1.2.3.3 Name of Owner
2.1.2.3.4 Name of Consultant
2.1.2.3.5 Name of Construction Manager
2.1.2.3.6 Page number

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

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

2.1.2.6 Include space for Construction Manager’s Correction or Completion Date.

2.1.2.7 A suggested format is as follows, prepared on Construction Manager’s Letterhead:

<table>
<thead>
<tr>
<th>Item Number</th>
<th>Room Number</th>
<th>Location (Area)</th>
<th>Description</th>
<th>Value ($)</th>
<th>Correction / Completion Date</th>
<th>Consultant’s Verification Check</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>W211</td>
<td>Room Name</td>
<td>Description of damage or deficiency. Cause of damage or deficiency. Recommended correction or completion procedure.</td>
<td>Accurate value of repair or rectification</td>
<td>Filled in when completed</td>
<td>Consultant will check during final review</td>
</tr>
</tbody>
</table>
Execution

3.1 PRELIMINARY REVIEW

3.1.1 Consultant will conduct a preliminary review after receipt of deficiency list and confirm contents, and may list additional items arising from preliminary review.

3.1.2 Modifications to the deficiency list will be discussed with the Construction Manager. Construction Manager will be requested to update list to reflect changes arising from preliminary review ready for request for final review.

3.2 INTERIM PROCEDURES

3.2.1 Prior to requesting final review, the Construction Manager shall undertake the following items in preparation for declaration of Substantial Performance.

3.2.2 Submit a written certificate to Consultant that the following have been performed:

3.2.2.1 Work has been completed and inspected for compliance with Contract Documents.
3.2.2.2 Construction Manager's start-up of equipment and systems, functioning within normal operating parameters.
3.2.2.3 Defects have been corrected and deficiencies have been completed.
3.2.2.4 Equipment and systems have been tested, adjusted and balanced and are fully operational.
3.2.2.5 Certificates required by Boiler Inspection Branch, Fire Commissioner and utility companies and all other authorities having jurisdiction have been submitted.
3.2.2.6 Completed Operation and Maintenance Data Manuals have been submitted to Consultant.
3.2.2.7 Record Drawings and Specifications have been completed and submitted to Consultant.
3.2.2.8 Operation of systems have been demonstrated to Owner's personnel.
3.2.2.9 Work is complete and ready for Final Review.
3.2.2.10 Witnessed test results and list of attendees.

3.2.3 Provide or complete the following items for the Owner prior to declaration of Substantial Performance:

3.2.3.1 Advise Owner of pending insurance changeover requirements.
3.2.3.2 Submit specific warranties, workmanship bonds, maintenance service agreements, final certifications, and similar documents.
3.2.3.3 Obtain and submit releases permitting Owner unrestricted use of the Work and access to services and utilities. Include occupancy permits, operating certificates, and similar releases.
3.2.3.4 Prepare and submit Project Record Documents, operation and maintenance manuals, final construction photographs, damage or settlement surveys, property surveys, and similar final record information.
3.2.3.5 Deliver tools, spare parts, extra materials, and similar items to location designated by Owner. Label with manufacturer's name and model number where applicable.
3.2.3.6 Make final changeover of permanent locks and deliver keys to Owner. Advise Owner's personnel of changeover in security provisions.
3.2.3.7 Complete start-up testing of systems.
3.2.3.8 Submit testing, adjusting and balancing records.
3.2.3.9 Terminate and remove temporary facilities from Project site, along with mock-ups not forming a part of the final construction, construction tools, and similar elements.

3.2.3.10 Advise Owner of changeover in heat and other utilities.

3.2.3.11 Submit changeover information related to Owner's occupancy, use, operation, and maintenance.

3.2.3.12 Complete final cleaning requirements, including touch-up painting.

3.2.3.13 Touch up and otherwise repair and restore marred exposed finishes to eliminate visual defects.

### 3.3 FINAL REVIEW

3.3.1 Request final review when the Work identified in deficiency list noted as incomplete is completed or corrected. The Consultant and Construction Manager will make a final review of the Work.

3.3.2 Results of completed review will form the basis of Consultant’s acceptance of Certificate of Substantial Performance.

3.3.3 Should the Consultant determine that excessive deficiencies still exist, the final review will cease and the Construction Manager shall re-start the declaration procedure.

3.3.4 Should the Consultant accept that the Work is substantially performed:

3.3.4.1 The Consultant will issue an Letter of Acceptance of Construction Manager’s Certificate of Substantial Performance which will contain:

- 3.3.4.1.1 Acceptance of date for Substantial Performance
- 3.3.4.1.2 List of items to be completed or corrected
- 3.3.4.1.3 The time within which the Construction Manager shall complete or correct the Work of listed items
- 3.3.4.1.4 The amount of the holdback for deficiencies will be a minimum of 200% of the estimated cost to correct the deficiencies
- 3.3.4.1.5 Signature of:
  - Consultant
  - Subconsultants
  - Construction Manager
  - Owner

### 3.4 FINAL PAYMENT

3.4.1 Following completion of lien period, submit claim for final payment in accordance with General Conditions and Supplementary Conditions.

3.4.2 Submit certified copy of inspection list of items to be completed or corrected, endorsed and dated by Consultant. The certified copy of the list shall state that each item has been completed or otherwise resolved for acceptance.

### 3.5 FINAL ACCEPTANCE

3.5.1 Final acceptance of the Work will occur after completion of Performance Testing and Fine Tuning required by Section 01 75 16 –Start-up Procedures.

END OF SECTION
1 General

1.1 SUMMARY

1.1.1 An organized compilation of operating and maintenance data including detailed technical information, documents and records describing operation and maintenance of individual products or systems as specified in individual sections of Divisions 02 through 49.

1.2 RELATED REQUIREMENTS

1.2.1 Section 01 33 00 – Submittal Procedures: Electronic documentation and submission requirements.

1.2.2 Section 01 79 00 – Demonstration and Training: Coordination of information requirements with actual demonstration and training on site.

1.2.3 Division 01 – General Commissioning Requirements: Coordination of verification data and start-up report sheets with information contained in Operation and Maintenance Manuals.

1.2.4 Division 23 – Heating, Ventilating, and Air Conditioning (HVAC): Specific documentation requirements for mechanical systems relating to various Tender Package documents.

1.2.5 Division 26 – Electrical: Specific documentation requirements for electrical systems relating to various Tender Package documents.

1.3 ADMINISTRATION REQUIREMENTS

1.3.1 Approvals Process: Submission of operations and maintenance data will follow a two stage review process as follows:

1.3.1.1 Preliminary Submission: Submit one (1) copy of proposed binder cover content and table of contents indicating proposed data contents; Consultant and Owner will review and may adjust listing based on actual building needs.

1.3.1.2 Approval Submission: Submit two (2) hard copy drafts of Operation and Maintenance Manuals to Consultant for review and distribution to Owner for approval:

1.3.1.2.1 Submission of individual operation and maintenance data will not be accepted; only complete Manuals will be reviewed.

1.3.1.2.2 Allow a minimum of four (4) weeks for Owner to review and approve Operation and Maintenance Manuals; make requested changes before submitting final hard and electronic copies.

1.3.1.2.3 Completion and final acceptance by Owner of Operation and Maintenance Manuals is a prerequisite for declaration of Substantial Performance for the Project.

1.3.2 Coordination: Coordinate work of this Section with related requirements and contents of Technical Specifications for individual Tender Packages and allow sufficient time for preparation of manuals, Owners review and approval procedures, corrections by individual contributors to the manual and date of Substantial Performance for the Project.
1.4 SUBMITTALS

1.4.1 Provide required information in accordance with Section 01 33 00 – Submittal Procedures.

1.4.2 Action Submittals: Provide the following submittals to Consultant two (2) weeks before application for Substantial Performance of project:

1.4.2.1 Operation and Maintenance Manuals:
  1.4.2.1.1 Final Electronic Version: Provide three (3) copies of manufacturer’s maintenance manuals and operational schematics scanned or native format PDF on CDROM.
  1.4.2.1.2 Final Paper Version: Provide one (1) copy of manufacturer’s maintenance manuals and operational schematics, bound as specified in this Section.

2 Products

2.1 OPERATION AND MAINTENANCE MANUALS

2.1.1 Assemble, coordinate, bind and index required data into Operation and Maintenance Manual arranged by the same MasterFormat Division numbers and titles used for the project, and as follows:

2.1.1.1 Submit required copies in English language.
2.1.1.2 Label each division and section with tabs protected with celluloid covers fastened to hard paper dividing sheets.
2.1.1.3 Type lists and notes; handwritten information will not be acceptable.
2.1.1.4 Drawings, diagrams and manufacturer's literature must be legible.

2.1.2 Binders:

2.1.2.1 Extension type catalogue binders bound with heavy fabric, hot stamped in gold lettering front and spine.
2.1.2.2 Limit binder size to a maximum of 75 mm and no more than 2/3 full.
2.1.2.3 Binder Colours:
  2.1.2.3.1 Architectural: Black
  2.1.2.3.2 Mechanical: Green
  2.1.2.3.3 Electrical: Royal Blue
  2.1.2.3.4 Shop Drawings: Red

3 Execution

3.1 ASSEMBLY OF MANUALS

3.1.1 Architectural Binder: Coordinate requirements of Architectural binders with specific requirements contained in the Technical Specifications required for each Tender Package; include cover sheets identifying:

3.1.1.1 Date submitted
3.1.1.2 Project title, location and project number
3.1.1.3 Names and addresses of Construction Manager and all Trade Contractors
3.1.1.4 Table of Contents of all binder volumes and disciplines
3.1.1.5 List of warranties and guaranties for the project
3.1.1.6 List of approvals and certificates for the project
3.1.2 Mechanical and Electrical Binders: Coordinate contents of mechanical and electrical binders with operation and maintenance manual requirements listed in Division 23 and Division 26 relating to specific Tender Packages; include cover sheets identifying:

3.1.2.1 Date submitted
3.1.2.2 Project title, location and project number
3.1.2.3 Names and addresses of Construction Manager and Trade Contractors contributing to contents of individual mechanical and electrical binders
3.1.2.4 Table of Contents of individual mechanical and electrical binder volumes
3.1.2.5 List of warranties and guarantees contained in the individual mechanical and electrical binders
3.1.2.6 List of approvals and certificates contained in the individual mechanical and electrical binders

3.1.3 Shop Drawings Binder: Coordinate contents of shop drawing binders with submission requirements listed in the Technical Specifications required for each Tender Package:

3.1.3.1 Date submitted
3.1.3.2 Project title, location and project number
3.1.3.3 Names and addresses of Construction Manager and Trade Contractors contributing to contents of shop drawing binder
3.1.3.4 Table of Contents of individual shop drawings cross referenced to Architectural, Mechanical and Electrical binder locations
3.1.3.5 Bind one complete set into a clear plastic sleeve of reviewed final shop drawings and product data

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

3.1.4.1 Tab Contents:
3.1.4.1.1 Vendor name
3.1.4.1.2 Equipment make, model and serial number

3.1.4.2 Spare parts lists:
3.1.4.2.1 Source of spare parts for materials that are not kept at site
3.1.4.2.2 List of spare parts that are required to be kept at site

3.1.4.3 Warranty or Guaranty information and claim procedure specific to material, product or system

3.1.4.4 Operation Data: Description of each system and its controls and as follows:
3.1.4.4.1 Control schematics for each system including environmental controls
3.1.4.4.2 Description of operation of each system at various loads together with reset schedules and seasonal variances
3.1.4.4.3 Operation instruction for each system and each component
3.1.4.4.4 Description of actions to be taken in event of equipment failure

3.1.4.5 Maintenance Data: Servicing, maintenance, operation and troubleshooting instructions for each item of equipment and as follows:
3.1.4.5.1 Maintenance schedules with tasks and frequencies including listing of tools required to complete maintenance and estimated task time
3.1.4.6 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:

3.1.4.6.1 Equipment performance verification test results
3.1.4.6.2 Special performance data as specified in individual Technical Specification Sections

3.1.5 Index of Operation and Maintenance Manuals: Include an index based on Systems that cross reference the MasterFormat Division, Number and Title, and Volume including; but not limited to, the following:

3.1.5.1 Include equipment as specified in mechanical and electrical specification sections.

3.1.6 Additional Data: Prepare and insert additional information that becomes apparent during demonstration and instructions to owner when it is evident that operations and maintenance information is insufficient or requires clarification.

END OF SECTION
1 General

1.1 RELATED REQUIREMENTS

1.1.1 Section 01 33 00 – Submittal Procedures: Retention of Shop Drawings for inclusion in Project Record Documentation.

1.1.2 Section 01 45 16.23 – Site Quality Control Procedures - Durable Building Quality Management Program: Recording as-constructed information relating to constructability required for LEED durable building credit.

1.1.3 Section 01 73 00 – Execution: Site engineering and final survey requirements.

1.1.4 Section 01 77 00 – Project Closeout Procedures: Closeout submittals.

1.2 DEFINITIONS

1.2.1 Record Documents: Record Documents consist of Divisions 01 to 49 forming the Specifications contained in the Project Manual and Drawings issued for Bid as modified by subsequent addenda, bid revisions, contract modification documents and change orders and can also include:

1.2.1.1 Information derived from submittals received during construction including shop drawings and product data.

1.2.1.2 Operations and maintenance information and other project closeout information including start-up, testing and balancing reports, and commissioning reports.

1.2.1.3 Record information submitted by the Construction Manager as a representation of the final design that will be incorporated in a manner identified in the Owner-Consultant Agreement and the Contract for transmission of Project Completion Documents.

1.3 ADMINISTRATIVE REQUIREMENTS

1.3.1 Designation of Record Documents: Construction Manager will, at commencement of the Work establish one set of the following documents to be designated and retained as a part of the Record Documents:

1.3.1.1 One (1) hard copy set of Project Manuals (Specifications)
1.3.1.2 Three (3) complete hard copy sets of Drawings (Construction Coordination Set, Mechanical and Electrical Sets)
1.3.1.3 One set of all Addenda and Bid Modifications issued during bid period
1.3.1.4 One set of all Change Directives and Change Orders issued during construction

1.3.2 Coordination: Trade Contractor must coordinate as constructed information and must report to the Construction Manager required information for recording of information on Drawings forming a part of the Record Documents.

2 Products

2.1 NOT USED

3 Execution

3.1 RECORDING INFORMATION ON PROJECT RECORD DOCUMENTS

3.1.1 Construction Manager will provide red-line drawings to the Owner with the exception of both Mechanical and Electrical Trade Contractors.
3.1.2 Mechanical and Electrical Trade Contractors shall record their information on red-line drawings and return to Construction Manager for final coordination.

3.1.3 Use coloured erasable pencils to record information.

3.1.4 Trade Contractors shall report to Construction Manager all changes and variations from Contract Drawings concurrently with construction process. Do not conceal any work until required information is recorded.

3.1.5 Trade Contractor shall provide sufficient information so that Construction Manager can legibly mark project record drawings to record actual construction including, but not limited to the following:

3.1.5.1 Measured locations of internal utilities and appurtenances concealed in construction referenced to visible and accessible features of construction.
3.1.5.2 Site changes of dimension and detail
3.1.5.3 Changes to equipment layout and services
3.1.5.4 Deviations in piping, duct runs, wiring, and utility connections
3.1.5.5 Actual locations of mechanical and electrical equipment, plumbing lines, electrical, data and communications lines referenced to fixed structural elements for items that are schematically indicated in Contract Documents.
3.1.5.6 Clearly identify locations of fire dampers, major control lines, access doors, tagged valves, and actual final room names or numbers.
3.1.5.7 Changes in construction materials or locations required by on-site conditions and to make components of the Work come together.
3.1.5.8 Changes required by Addenda, Bid Revisions, Change Orders, Work Orders and Construction Communications.
3.1.5.9 Other information identified in specific sections of the Specifications.

3.1.6 Construction Manager will maintain Record Documents at the site office and make available for review during all site meetings.

3.1.7 Trade Contractor shall make recordings immediately after the respective Work is completed and not less than once a week. Each recording shall be dated.

3.1.8 Changes to specification sections shall be legibly noted in the margins of the document or by stapling a sheet of white paper to the margin and referencing the affected article(s). Use of adhesive tape or self-sticking removable notes will not be acceptable for this purpose.

3.1.9 Consultant will review the drawing changes in print form. When accepted, the Consultant will incorporate all drawing deviations noted on Computer Aided Drafting and Design System “AutoCAD ®” in version required by Owner.

3.1.10 The Consultant’s review of Record Documents is not a verification of the accuracy of the record drawings. Responsibility for accuracy lies solely with the Construction Manager:

3.1.10.1 Where subsequent reviews or modifications to the Work occur during the Warranty Period indicate that the Record Drawings contain inaccuracies, the Owner reserves the right to verify or survey as-built conditions by an independent agency.
3.1.10.2 Where inaccuracies are contained within the Record Drawings, the Construction Manager shall be responsible for costs of independent survey agency and costs related to revisions to the Record Drawings.
3.2 SUBMISSION OF PROJECT RECORD DOCUMENTS

3.2.1 Construction Manager will submit balance of completed project record documents before or with application for Substantial Performance of the Work.

3.2.2 Submit with each submission a covering letter including:

3.2.2.1 Date of Submission
3.2.2.2 Project Title and Project Number
3.2.2.3 Trade Contractor's name, address and telephone number

3.2.3 Construction Manager will submit one neatly marked set of Record Documents at Substantial Performance of the Work. Trade Contractor shall make Construction Manager fully aware of all changes to site constructed work.

3.3 INCORPORATION OF RECORD INFORMATION

3.3.1 Consultant will review Specification changes provided by Construction Manager for general conformance to Contract Documents, and incorporate any deviations noted by modifying the electronic source files and providing a Portable Document Format (PDF) file of the completed changes as required by the Owner.

3.3.1 Consultant will review the Drawing changes provided by Construction Manager for general conformance to Contract Documents in print form and will incorporate all Drawing deviations noted by modifying the electronic source file to type, version and standard required by Owner.

3.3.2 The Consultant's review of Record Documents is not a verification of the accuracy or completeness of the Record Documents; responsibility for accuracy lies solely with the Construction Manager:

3.3.2.1 The Owner reserves the right to verify or survey as-built conditions by an independent agency where subsequent reviews or modifications to the Work occur during the Warranty Period indicate that the Record Documents contain inaccuracies.
3.3.2.2 Construction Manager will be held responsible for costs of independent survey agency and costs related to revisions to the Record Documents where inaccuracies are contained within the Record Documents.

3.3.3 Consultant will mark Record Documents with a statement indicating that the Record Documents have been prepared based on information provided by the Construction Manager and that the Consultant is not be responsible for any errors or omissions that may be incorporated as a result of any erroneous information provided by the Construction Manager.

END OF SECTION
1 General

1.1 RELATED REQUIREMENTS

1.1.1 Section 01 77 00 – Closeout Procedures

1.1.2 Divisions 2 through 49 of the Project Manual for individual products or systems as specified in individual sections and not otherwise listed in this section.

1.2 QUALITY ASSURANCE

1.2.1 Source of Supply: Provide spare parts manufactured by original equipment manufacturer and that are identical to those installed.

1.3 DELIVERY, STORAGE, AND HANDLING

1.3.1 Delivery and Acceptance Requirements: Deliver required items to the Place of the Work and store in temporary locations determined by Construction Manager or permanent locations designated by Owner; in original factory packaging or other securely packaged form.

1.3.2 Storage and Handling Requirements: Identify, on carton or package, name of item, colour or part number, as applicable. Identify equipment, system, area, room number and other unique identifier for which each item is intended, and as follows:

1.3.2.1 Maintain an inventory list of all items delivered. For each item, record description of item, quantity, and location where stored.

1.3.2.2 Stored items shall remain in Construction Manager's care, custody, and control until Substantial Performance of the Work. Protect stored items against theft or damage.

1.3.2.3 Handle items as necessary, until stored in permanent locations designated by Owner.

2 Products

2.1 NOT USED

3 Execution

3.1 ACCEPTANCE

3.1.1 Prior to requesting Owner's inspection for Substantial Performance, do the following:

3.1.1.1 Review Contract Documents and compare with inventory list to verify that all required items have been delivered.

3.1.1.2 Verify that items listed on inventory list are in their designated storage locations.

3.1.1.3 Inspect items to verify that they meet specified requirements and are in serviceable condition.

3.1.1.4 Arrange for delivery of any missing items.

3.1.1.5 Arrange for replacement of items not meeting specified requirements or not in serviceable condition.

3.1.1.6 Provide Owner with copy of inventory list indicating status of all required items.

3.1.2 Review inventory list with Owner during review for Substantial Performance.
3.1.3 Provide a duplicate copy delivery slip and obtain Owner's signature upon delivery for items not delivered prior to Substantial Performance of the Work; Owner will only accept responsibility for care, custody, and control of items properly received and signed for.

3.2 SCHEDULE

3.2.1 Provide spare parts and maintenance materials specified in the technical specification Sections.

3.2.2 Provide maintenance materials in whole pieces, boxed and packaged in original wrapping or wrapped and identified for material and location within the building.

END OF SECTION
1 General

1.1 SUMMARY

1.1.1 This Section includes administrative and procedural requirements for instructing Owner's personnel, including the following:

1.1.1.1 Demonstration of operation of systems, subsystems, and equipment
1.1.1.2 Training in operation and maintenance of systems, subsystems, and equipment
1.1.1.3 Demonstration and instruction videos

1.2 RELATED REQUIREMENTS

1.2.1 Section 01 77 00 – Closeout Procedures: Facility start-up requirements.
1.2.2 Division 01 – General Commissioning Requirements: Operations and maintenance training required for ongoing building lifecycle commissioning.
1.2.3 Specific requirements for demonstration and instruction for products listed in individual technical specification sections contained in the Project Manual.

1.3 ADMINISTRATIVE REQUIREMENTS

1.3.1 Coordination: Coordinate instruction schedule with Owner's operations; adjust schedule as required to minimize disrupting Owner's operations and as follows:

1.3.1.1 Coordinate instructors, including providing notification of dates, times, length of instruction time, and course content.
1.3.1.2 Coordinate content of training modules with content of approved emergency, operation, and maintenance manuals; do not submit instruction program until operation and maintenance data has been reviewed and accepted by the Consultant.
1.3.1.3 Coordinate individual presentations and ensure representatives scheduled to present at seminars are in attendance.

1.4 SUBMITTALS

1.4.1 Provide required information in accordance with Section 01 33 00 – Submittal Procedures.
1.4.2 Submit two (2) copies of outline of instructional program for demonstration and instruction, including a schedule of proposed dates, times, length of instruction time, and instructors' names for each training module:

1.4.2.1 Include learning objective and outline for each training module.
1.4.3 Submit qualification data for facilitator and videographer.

1.5 PROJECT CLOSEOUT SUBMISSIONS

1.5.1 Provide operations and maintenance information in accordance with Section 01 78 23 – Operations and Maintenance Data.
1.5.2 Submit attendance record for each training module, submit list of participants and length of instruction time.
1.5.3 Submit evaluations for each participant and for each training module, submit results and documentation of performance based test.
1.5.4 Submit one (1) complete training manual for Owner's use at completion of training.

1.5.5 Submit two (2) demonstration and instruction videos within seven (7) days after the end of each training module.

1.5.6 Identify each copy of training manuals [and videos] with an applied label containing the following information:

- 1.5.6.1 Name of Project
- 1.5.6.2 Name of Consultant
- 1.5.6.3 Name of Construction Manager
- 1.5.6.4 Name and address of videographer
- 1.5.6.5 Date video was recorded
- 1.5.6.6 Description of vantage point, indicating location, direction by compass point, and elevation or storey of construction that videos were made.

1.5.7 Include a transcript of video training modules prepared on nominal 215 mm x 280 mm paper for inclusion in appropriate section of completed training manuals, containing same label information as the corresponding video.

1.6 QUALITY ASSURANCE

1.6.1 Facilitator shall be a company or individual experienced in training or educating maintenance personnel in a training program similar in content and extent to that indicated for this Project, and whose work has resulted in training or education with a record of successful learning performance.

1.6.2 Instructor shall be a factory authorized service representative, qualified by the manufacturer and experienced in operation and maintenance procedures and training.

1.6.3 Videographer shall be a professional photographer who is experienced photographing construction projects and training sessions.

1.6.4 Conduct a Pre-Instruction Conference in accordance with Section 01 31 19 – Project Meetings to review methods and procedures related to demonstration and instruction.

2 Products

2.1 PREPARATION OF AGENDAS AND OUTLINES

2.1.1 Prepare agendas and outlines including the following:

- 2.1.1.1 Equipment and systems which will be included in seminars
- 2.1.1.2 Name of companies and representatives presenting at seminars
- 2.1.1.3 Outline of each seminar's content
- 2.1.1.4 Time and date allocated to each system and item of equipment
- 2.1.1.5 Refer to Article 3.3 below for sample agenda format

2.2 PROGRAM STRUCTURE

2.2.1 Develop a learning objective and teaching outline for each training module, that shall include the following minimum instruction requirements:

- 2.2.1.1 Description of specific skills and knowledge that participants are expected to master
- 2.2.1.2 System, subsystem, and equipment descriptions
2.2.1.3 System design and operational philosophy if Trade Contractor is delegated design responsibility, including the following:

2.2.1.3.1 An overview of how system is intended to operate.
2.2.1.3.2 Description of design parameters, constraints and operational requirements
2.2.1.3.3 Description of system operation strategies

2.2.1.4 Regulatory requirements

2.2.1.5 Equipment function

2.2.1.6 Operating characteristics

2.2.1.7 Limiting conditions

2.2.1.8 Performance curves

2.2.1.9 Documentation:

2.2.1.9.1 Emergency manuals
2.2.1.9.2 Operations manuals
2.2.1.9.3 Maintenance manuals
2.2.1.9.4 Project Record Documents
2.2.1.9.5 Identification systems
2.2.1.9.6 Warranties and bonds
2.2.1.9.7 Maintenance service agreements and similar continuing commitments

2.2.1.10 Emergencies:

2.2.1.10.1 Instructions on meaning of warnings, trouble indications, and error messages
2.2.1.10.2 Instructions on stopping
2.2.1.10.3 Shutdown instructions for each type of emergency
2.2.1.10.4 Operating instructions for conditions outside of normal operating limits
2.2.1.10.5 Sequences for electric or electronic systems
2.2.1.10.6 Special operating instructions and procedures

2.2.1.11 Operations:

2.2.1.11.1 Start-up procedures
2.2.1.11.2 Equipment or system break-in procedures
2.2.1.11.3 Routine and normal operating instructions
2.2.1.11.4 Regulation and control procedures
2.2.1.11.5 Control sequences
2.2.1.11.6 Safety procedures
2.2.1.11.7 Instructions on stopping
2.2.1.11.8 Normal shutdown instructions
2.2.1.11.9 Operating procedures for emergencies
2.2.1.11.10 Operating procedures for system, subsystem, or equipment failure
2.2.1.11.11 Seasonal and weekend operating instructions
2.2.1.11.12 Required sequences for electric or electronic systems
2.2.1.11.13 Special operating instructions and procedures

2.2.1.12 Adjustments:

2.2.1.12.1 Alignments
2.2.1.12.2 Checking adjustments
2.2.1.12.3 Noise and vibration adjustments
2.2.1.12.4 Economy and efficiency adjustments
2.2.1.13 Troubleshooting:

2.2.1.13.1 Diagnostic instructions
2.2.1.13.2 Test and inspection procedures

2.2.1.14 Maintenance:

2.2.1.14.1 Inspection procedures
2.2.1.14.2 Types of cleaning agents to be used and methods of cleaning
2.2.1.14.3 List of cleaning agents and methods of cleaning detrimental to product
2.2.1.14.4 Procedures for routine cleaning
2.2.1.14.5 Procedures for preventive maintenance
2.2.1.14.6 Procedures for routine maintenance
2.2.1.14.7 Instruction on use of special tools

2.2.1.15 Repairs:

2.2.1.15.1 Diagnosis instructions
2.2.1.15.2 Repair instructions
2.2.1.15.3 Disassembly; component removal, repair, and replacement; and reassembly instructions:
   - Instructions for identifying parts and components
   - Review of spare parts needed for operation and maintenance

2.2.2 Present information dealing with equipment, including the following in presentations:

2.2.2.1 Explanation of how equipment operates
2.2.2.2 Recommended preventative and routine maintenance

2.2.3 Develop individual training modules for each system and equipment not part of a system, as required by individual specification sections, and as follows:

2.2.3.1 Motorized doors including overhead sectional doors, overhead coiling doors, overhead coiling grilles and automatic entrance doors
2.2.3.2 Equipment, including projection screens, loading dock equipment, stage equipment, waste compactors, food service equipment, appliances and laboratory fume hoods
2.2.3.3 Fire protection systems, including fire alarm, fire pumps and fire extinguishing systems; refer to Division 21 for additional requirements
2.2.3.4 Intrusion detection systems
2.2.3.5 Conveying systems including elevators and wheelchair lifts
2.2.3.6 Heat generation equipment including boilers, feed water equipment, pumps, steam distribution piping and water distribution piping; refer to Division 23 for additional requirements
2.2.3.7 Refrigeration systems including chillers, cooling towers, condensers, pumps and distribution piping; refer to Division 23 for additional requirements
2.2.3.8 HVAC systems including air handling equipment, air distribution systems and terminal equipment and devices; refer to Division 23 for additional requirements
2.2.3.9 HVAC instrumentation and controls; refer to Division 25 for additional requirements
2.2.3.10 Electrical service and distribution including transformers, switchboards, panel boards, uninterruptible power supplies and motor controls; refer to Division 26 and 27 for additional requirements
2.2.3.11 Packaged engine generators, including transfer switches; refer to Division 26 for additional requirements
2.2.3.12 Lighting equipment and controls; refer to Division 26 for additional requirements
2.2.3.13 Communication systems including intercommunication, surveillance, clocks and programming, voice and data and closed circuit television; refer to Division 27 for additional requirements

3 Execution

3.1 PREPARATION

3.1.1 Assemble educational materials necessary for instruction, including documentation and training module.
3.1.2 Assemble training modules into a combined training manual.
3.1.3 Set up instructional equipment at instruction location.

3.2 INSTRUCTION

3.2.1 Training Facilitator: Engage a qualified facilitator to prepare instruction program and training modules, to coordinate instructors, and to coordinate between Construction Manager, Trade Contractor and Owner for number of participants, instruction times, and location.

3.2.2 Scheduling: Provide instruction at mutually agreed on times; provide similar instruction at start of each season for equipment that requires seasonal operation:

3.2.2.1 Schedule training with Owner, through Construction Manager with at least seven (7) days advance notice.

3.2.3 Instruct Owner's personnel to adjust, operate, and maintain systems, subsystems, and equipment not part of a system as follows:

3.2.3.1 Provide instructors experienced in operation and maintenance procedures who can present the following:

3.2.3.1.1 Explain equipment operation
3.2.3.1.2 Starting and stopping procedures
3.2.3.1.3 Preventative and routine maintenance procedures

3.2.3.2 Provide instruction at mutually agreed on times.
3.2.3.3 Provide similar instruction at the start of each season for equipment that requires seasonal operation.
3.2.3.4 Arrange for presentation leaders familiar with the design, operation and maintenance, and troubleshooting of the equipment and systems.
3.2.3.5 Where a single person is not familiar with aspects of the equipment or system, arrange for specialists familiar with each aspect.

3.2.4 Demonstrate operation of equipment and systems. Include the following in demonstration:

3.2.4.1 Start up and shut down
3.2.4.2 Operation
3.2.4.3 Scheduled and preventative maintenance
3.2.4.4 Troubleshooting
3.2.4.5 Demonstration may be conducted at time of original starting with Owner's prior approval

3.2.5 Demonstration and instruction questions:
3.2.5.1 Be prepared to answer questions raised by Owner at demonstrations and seminars.
3.2.5.2 If unable to satisfactorily answer questions immediately, provide written response within three (3) days.

3.2.6 Evaluation: At conclusion of each training module, assess and document each participant's mastery of module by use of a written or demonstration performance based test.

3.2.7 Cleanup:
3.2.7.1 Collect used and leftover educational materials and turnover to Owner for their use.
3.2.7.2 Remove instructional equipment.
3.2.7.3 Restore systems and equipment to condition existing before initial training use.

3.3 SAMPLE AGENDAS
3.3.1 The following pages contain a sample agenda for use on this project.
3.3.2 Training facilitator or Instructor shall create similar agendas for each system, or piece of equipment not forming a part of a system, for each form of equipment demonstrated to the Owner.

3.4 DEMONSTRATION AND INSTRUCTION VIDEOS
3.4.1 Engage a qualified commercial videographer to record demonstration and instruction videos:
3.4.1.1 Record each training module separately.
3.4.1.2 Include classroom instructions and demonstrations, board diagrams, and other visual aids; but not student practice.

3.4.2 Record each chart containing learning objective and lesson outline at beginning of each training module.

3.4.3 Video Format:
3.4.3.1 Provide high quality, re-record protected high definition DVD colour video compatible with standard playback equipment in permanent, hard case storage box.

3.4.4 Recording:
3.4.4.1 Mount camera on tripod before starting recording, unless otherwise necessary to show area of demonstration and instruction.
3.4.4.2 Display continuous running time.
3.4.5 Narration:

3.4.5.1 Describe scenes on video by dubbing audio narration off-site after video is recorded; include description of items being viewed.

3.4.5.2 Describe vantage point, indicating location, direction (by compass point), and elevation or story of construction.

3.4.6 Transcript:

3.4.6.1 Provide a typewritten transcript of the narration.

3.4.6.2 Display images and running time captured from video opposite the corresponding narration segment.

REMAINDER OF PAGE LEFT INTENTIONALLY BLANK
[SYSTEM AGENDA]

Topic: ____________  Day: ____________  Start Time: [8:00 AM]

Meeting Place: Example Agenda Only, Actual Topics and Classroom Times shall be completed by Instructor or Training Facilitator

Approximate Duration: [7.5 hours]

Morning: .1 8:00 AM to 9:45 AM [Classroom Presentation]
          .2 10:00 AM to 12:00 Noon [Contractor/Supplier Presentation]

Lunch Break: 12:00 to 1:00

Afternoon: .3 1:00 PM to 2:30 PM [Site Walkthrough]
            .4 2:45 PM to 4:00 PM [Final Questions and Sign-off Log Sheet]

Required Personnel in Attendance:
- [Trade Contractor and Trade Contractors (as required)]
- [Owner’s Maintenance Staff]
- [Other Personnel]

Presentation Format:

Classroom:
- Introduction
- Present hand-outs of system description
- Reference to equipment operation brochures as required.
- Detailed system overview by Trade Contractor, Trade Contractors and Suppliers.
- Review of system installations by the Trade Contractor using record drawings.

Site Tour:
- Trade Contractor shall outline location of main piping runs, isolation valves, service access points.
- Review service procedures for system or piece of equipment.
- [Add additional site tour demonstrations or procedures.]
- Provide written instructions on how to start and stop all equipment and demonstrate using written instructions contained in the Operations and Maintenance Manuals during site tour.

END OF SECTION
General

1.1 WORK INCLUDED

1.1.1 Section 01 31 19 - Project Meetings

1.1.2 Section 01 33 00 - Submittal Procedures

1.1.3 Section 01 33 50 - Delegated Design Submittals

1.1.4 Section 01 35 31 - LEED Special Project Procedures

1.1.5 Provide all labour, materials, plant and equipment to complete the concrete formwork and falsework indicated on the drawings, including the installation of cast-in inserts and assemblies as specified.

1.2 RELATED WORK SPECIFIED ELSEWHERE

1.2.1 Concrete Reinforcement, Section 03 20 00.

1.2.2 Cast-in-Place Concrete, Section 03 30 00.

1.2.3 Architecturally Exposed Concrete, Section 03 33 00.

1.2.4 Concrete Floor Finishes, Section 03 35 00.

1.2.5 Structural Steel, Section 05 12 00 for anchor assemblies, bolts and the like to be cast into concrete.

1.2.6 Earthwork – Shortform, Section 31 00 00.01.

1.2.7 Common Work Results for Earthwork, Section 31 05 00.

1.2.8 Bored Concrete Piles, Section 31 63 23.

1.3 REFERENCE STANDARDS, CODES AND ACTS

1.3.1 Conform to the Alberta Building Code (ABC 2006) (The Building Code) as amended by all subsequent Alberta Regulations issued to the date of this specification and applicable acts of authorities having jurisdiction.

1.3.1.1 CSA A23.1-14/ CSA A23.2-14 Concrete Materials and Methods of Concrete Construction/Test Methods and Standard Practices for Concrete

1.3.1.2 CSA O86-09 Engineering Design in Wood

1.3.1.3 CSA O121-08 (R2013) Douglas Fir Plywood

1.3.1.4 CSA O151-09 Canadian Softwood Plywood

1.3.1.5 CSA O153-13 Poplar Plywood

1.3.1.6 CSA O437 Series-93 (R2011) OSB and Waferboard

1.3.1.7 CSA O325-07 (2012) Construction Sheathing

1.3.1.8 CSA S6-06 The Canadian Highway Bridge Code

1.3.1.9 CSA S269.1-1975 (R2003) Falsework for Construction Purposes
1.3.1.10 CAN/CSA-S269.3-M92 (R2008) Concrete Formwork
1.3.1.11 COFI (Council of Forest Industries Exterior Plywood for of British Columbia) Concrete Formwork

1.3.2 Where there are differences between the specifications and drawings and the codes, standards or acts, the most stringent shall govern.

1.3.3 Standards referenced within the Standards noted above are to apply even if they are not included in the list. Where such reference is made, it shall be to the latest edition and revision published.

1.4 TOLERANCES

1.4.1 Perform forming operations and place hardware so that finished concrete will be within the tolerances set out in CSA A23.1.

1.4.1.1 Variations in building lines which result in extension of the building over lot lines or restriction lines will not be permitted.

1.4.2 These tolerances are acceptable with regard to structural requirements. Interfacing tolerances may not be compatible with the above. Review and coordinate interfacing tolerances so that the various elements come together properly.

1.5 QUALIFICATIONS

1.5.1 The formwork, falsework, and reshoring shall be designed by a qualified Professional Engineer licensed in the Province of Alberta with a minimum of 5 years Canadian experience in the design of such temporary construction work.

1.6 DESIGN

1.6.1 Formwork, Falsework, and Reshoring.

1.6.1.1 Design formwork, falsework and reshoring to safely support vertical and lateral loads until they can be supported by the structure.

1.6.1.2 Design formwork to the requirements of CAN/CSA S269.3.

1.6.1.3 Design falsework to the requirements of CSA S269.1.

1.6.2 Reshores in the lower storeys shall be capable of safely carrying the full weight of the concrete, falsework, formwork and all construction live loads posted to them prior to the removal of the first storey of shores supported by the soil at grade.

1.6.2.1 The Level 0 slab is a structural slab at grade and has not been designed for specific reshoring loads.

1.6.2.2 The Level 1 to Level 1M slabs overtop of the encapsulation roof have not been designed for specific reshoring loads.

1.6.2.3 Refer to the Encapsulation Structural ES series drawings for maximum permanent and temporary loads that can be imposed on the encapsulation roof structure.

1.6.2.4 The Level 2 structural steel framing has been designed to resist the following temporary construction loads as a result of shoring the concrete floor Level 3...
above. An unfactored fixed shoring load of 10 kPa and an unfactored variable construction load of 2.5 kPa. Refer to loading plans in the structural drawings for more information.

1.6.3 After reshores are removed from the first suspended concrete floor (Level 3 and above), the design and provision of reshores may be based on the assumption that each shored or reshored flexural member shares load in relation to its achieved strength, provided the flexural member has attained at least 70% of its specified 28 day strength.

1.6.4 The east portion (bounded by Gridlines A and B) of the reinforced concrete slabs at Levels 3, 4, and main roof are not structurally stable until the slabs are tied into the structural steel framed east administration (Back-of-House) portion. This assumes that the east administration (Back-of-House) portion has been framed first and reached its intended lateral resisting strength.

1.6.4.1 Design shores for these slabs and walls to safely support the total vertical and lateral loads until the walls and slabs are complete and connected to the east administration (Back-of-House) portion and have reached 70% of their specified strength. Design the shores so that they can be unloaded gradually.

1.6.5 Bearing Assemblies

1.6.5.1 Design bearing assemblies so that they conform to the configurations shown and can safely transmit the loads and permit the movements noted.

1.6.5.2 Neoprene Bearing Pads for Acoustic Isolated Floating Slabs

1.6.5.2.1 Basis of structural design assumes a Mason EAFM LDS mount.

1.6.5.2.2 Design bearing pads of a suitable shape and material that can safely transmit the forces shown while permitting the following vertical movements:

- All floating slabs with wood or carpet floor finish: 5 mm max vertical movement under service loads.

- All floating slabs with no floor finish (i.e. polished concrete): 3 mm max vertical movement under service loads.

1.6.5.3 Neoprene Bearing Pads for Acoustic Isolated Theatre Raker Beams

1.6.5.3.1 Basis of structural design assumes a Mason Type BBNR rubber isolation pad.

1.6.5.3.2 Design bearing pads of a suitable shape and material that can safely transmit the forces shown while permitting a 3 mm vertical movement.

1.6.5.3.3 Refer to structural drawings for assumed bearing pad assembly sizes.

1.6.5.3.4 Refer to structural drawings for assumed seismic lateral restraint details.

1.6.5.4 Sliding Movement PTFE Joint Bearing for Truss 4

1.6.5.4.1 Design bearing to safely transmit the range of movements and loads indicated at a bearing stress not exceeding Table
11.3 in CSA S6-06, and such that the maximum static or
dynamic co-efficient of friction shall not be greater than 0.06
at a bearing stress of 21 MPa.

1.6.5.4.2 Design bearing to provide a range of movements of plus or
minus 50 mm (1") in direction parallel with truss span and a
maximum rotation of 0.005 rad, unless noted otherwise.

1.7 SUBMITTALS

1.7.1 Submit submittals in accordance with Section 01 33 00 – Submittal Procedures.

1.7.2 Sustainable Design Submittals: Coordinate project sustainable design requirements with
Section 01 35 31 – LEED® Special Project Procedures.

1.7.3 Shop Drawings for Formwork, Falsework, and Reshoring

1.7.3.1 Reproduction of the structural drawings, to serve as a basis for the
preparation of shop drawings, will be permitted and is subject to a separate
agreement between the Consultant and the Construction Manager. Any costs
associated with the preparation of the structural drawings for use by the
Trade Contractor and Construction Manager shall be paid for by this Section.
Refer to Section 01 31 26 – Electronic Communications Protocol for BIM.

1.7.3.2 Unless noted otherwise, on all shop drawings provide adequate space
immediately above the drawings title block for a Consultant’s Shop Drawing
review stamp. Where requested by the Consultant, the stamp is to be
inserted by this section directly into the shop drawing prior to submission.
The stamp shall be positioned in the same location on each shop drawing,
and in no case shall the allocated space be less than 63 x 75 mm (2.5 × 3”).
Request the details of these requirements from the Consultant no less than 2
weeks before the commencement of shop drawings.

1.7.3.3 Well in advance of construction, submit to the Prime Consultant shop
drawings showing the complete design and detailing of the slab formwork,
falsework and reshoring systems stamped by a qualified Professional
Engineer licensed in the Province of Alberta.

1.7.3.4 As a minimum, the shop drawings shall show the following:

1.7.3.4.1 All design assumptions including references to the relevant
codes, standards and sets, design loads, assumed concrete
placing rate and the like.

1.7.3.4.2 Layout of formwork panels and shores;

1.7.3.4.3 Formwork details related to stripping and reshoring;

1.7.3.4.4 Camber;

1.7.3.4.5 Sequence for installing reshores;

1.7.3.4.6 Stripping schedule;

1.7.3.4.7 Number of slabs reshored at any given time;

1.7.3.4.8 Method, sequence, and schedule of construction, materials,
arrangement of joints, form ties, shores, liners and locations
of temporary embedded parts in architectural form concrete elements; and

1.7.3.4.9 Complete details associated with forming sloped slabs together with placing and compaction procedures for sloping slabs, including details of construction and placing of top forms.

1.7.3.5 Include in the shop drawing submission a method statement as to how the specified cambers will be achieved in the field.

1.7.4 Construction Joints

1.7.4.1 Well in advance of construction, submit to the Prime Consultant and Structural Consultant shop drawings showing the location of all horizontal and vertical construction joints in the structure. Drawings shall include plans, wall elevations and additional sections and details (as necessary) which clearly indicate the proposed location of the joints. Drawings shall include dimensions for all construction joints to reference grid lines and elevations.

1.7.4.2 Drawings to include any specific provisions or requirements where the elements are noted to be poured monolithically on the Contract Documents.

1.7.4.3 Refer to structural drawings and 03 33 00 – Architecturally Exposed Concrete for locations of construction joints in architecturally exposed concrete elements.

1.7.4.4 Honeycombed Concrete

1.7.4.5 Submit a proposed method statement for the repair of honeycombed concrete, including a list of suitable products, for the following depths of honeycombing:

1.7.4.5.1 Less than 20 mm;

1.7.4.5.2 20 to 60 mm; and

1.7.4.5.3 Greater than 60 mm.

1.7.5 Lift Drawings

1.7.5.1 Submit lift drawings of the structure showing, all cast-in or embedded items, openings, recesses and sleeving required by all Trade Contractors, for the Prime Consultant’s and Structural Consultant’s review. Drawings shall be submitted a minimum of 30 days prior to the commencement of the reinforcement detailing of the area outlined on the lift drawings.

1.7.5.2 All embedded items, openings, sleeves, chases are not necessarily shown on the structural drawings nor are their sizes or locations shown. Refer to architectural, mechanical and electrical drawings and specifications and the detailed shop drawings prepared by the appropriate Trade Contractors for openings and sleeving requirements not shown, located and dimensioned on the structural drawings.

1.7.5.3 Openings, sleeves, chases embedded items and the like are to be fully dimensioned from grid lines in plan and floor levels in elevation. Information including sizes, dimensions, locations, elevations etc. is to be drawn to scale on a set of structural drawings.
1.7.5.4 Openings and embedded items required by all Trade Contractors are to be shown and coordinated on a single set of lift drawings.

1.7.5.5 Lift drawings are to be reviewed by the Construction Manager prior to submission to the Consultant.

1.7.5.6 The Construction Manager’s review stamp is to be affixed to all lift drawings that are submitted for review.

1.7.6 Surveys

1.7.6.1 The Trade Contractors to submit surveys showing position of formwork, cast-in-place inserts and structural elements as noted below.

1.7.6.2 As a minimum include the following:

1.7.6.2.1 Elevation and location of centreline with respect to grids of all piles;

1.7.6.2.2 Location of centreline of all columns with respect to grids at each floor level;

1.7.6.2.3 Location with respect to grids and horizontal alignment of all concrete walls at all floor levels;

1.7.6.2.4 Vertical alignment (plumbness) of all columns and walls at all floor levels;

1.7.6.2.5 Vertical alignment and elevator hoistway dimensions at all floor levels; and

1.7.6.2.6 Elevation of slab formwork and slabs at all columns, walls, centre of bays, midway between columns along gridlines and at cantilever ends, at points of maximum camber on all floor levels at the following times:

- Before concrete placement.
- After concrete placement, prior to removal of any formwork and reshores from below.
- Between 7 and 14 days after removal of all reshores immediately above and below the subject floor.

1.7.6.7 Location and alignment of edge of slabs with respect to grids at all floor levels;

1.7.6.8 Location and elevation of cast-in-place hardware at all levels.

1.7.6.3 All surveys submitted must clearly indicate the date when the survey was carried out.

1.7.7 Bearing Assemblies

1.7.7.1 Submit shop drawings and technical specifications for the bearing assemblies, neoprene bearing pads (including Elastomeric Acoustical Flooring Mounting for Floating Floors and Beams), sliding movement joint bearing assemblies to the Structural Consultant for review. Drawings shall bear the seal and signature of a qualified Professional Engineer licensed in the Province of Alberta.
1.7.8 As-Built Drawings

1.7.8.1 Mark on a complete set of final drawings any changes, additions or deletions that occur during construction as a result of the Trade Contractor’s work, change orders, or for any other reason.

1.7.8.2 For all shop drawings marked “Reviewed as Noted” or “Revise and Resubmit”, update and submit a record set of these drawings at the completion of the structural work. Ensure that these drawings reflect the changes and are coordinated with the final drawings noted above.

2 Products

2.1 MATERIALS

2.1.1 Formwork

2.1.1.1 Formwork lumber: Conform to O86.1 and CSA - O325.0.

2.1.1.2 Falsework materials: Conform to CSA S269.1.

2.1.1.3 Sheathing for exposed surfaces: New, Douglas Fir plywood not less than 19 mm (¾”) thick, concrete form grade, sanded one side, conforming to CSA-O325.0 except for 03 33 00 – Architecturally Exposed Concrete.

2.1.1.4 Preformed Steel Forms: Minimum 1.6 mm or 16 gauge matched, tight fitting, stiffened to support weight of concrete without deflection detrimental to tolerances and appearance of finished surfaces.

2.1.1.5 Corners: 90 degree corners for 03 33 00 Architecturally Exposed Concrete.

2.1.2 Sliding PTFE Bearings: as manufactured and supplied by Sorbtex (R.J Scearce Assoc., Burlington), or by Goodco Z-Tech or an approved consisting of bearing assembly with bonded PTFE sheets safely transmitting the loads and movements indicated and conforming to CSA S6-06.

2.1.3 Neoprene Bearing Pads: Molded or cut from a sheet of high-grade, neoprene synthetic rubber compound and conforming to current issue of CSA S6-06.

2.1.4 Waterstops

2.1.4.1 Construction and Control Joints: Provide bentonite waterstop RX-101 as manufactured by ETCO.

2.1.5 Dovetail anchor slots: Minimum 0.8 mm thick (22 gauge) galvanized steel with insulation filled slots.

2.1.6 Flashing Reglets: Minimum 0.8mm (22 gauge) thick galvanized steel with alignment splines for joints.

2.1.7 Form Spacers: Stay-in-place form spacers exposed to weather, earth, or moisture may not be made of wood, and must be corrosion and decay resistant. Form spacers legs in architecturally exposed concrete to closely match concrete colour.

2.1.8 Architecturally Exposed Concrete Form Materials – refer to 03 33 00 Architecturally Exposed Concrete.

2.1.9 Reinforcing steel chair leg ends in architecturally exposed concrete to closely match concrete colour.
3 Execution

3.1 PRE-CONSTRUCTION CONFERENCE

3.1.1 At least 21 days prior to the commencing of concrete construction, the Construction Manager shall hold a pre-construction meeting to review the requirements of the project.

3.1.1.1 The Construction Manager shall require responsible representatives of every party that is involved in the concrete work to attend the conference, including but not limited to the following:

3.1.1.1.1 Construction Manager
3.1.1.1.2 Concrete Forming Trade
3.1.1.1.3 Concrete Supplier Trade
3.1.1.1.4 Reinforcement Fabricator/Placer
3.1.1.1.5 Structural steel fabricator/installer
3.1.1.1.6 All Inspection and Testing Agencies
3.1.1.1.7 Consultant
3.1.1.1.8 Owner’s Representative

3.1.1.2 Minutes of the meeting shall be recorded and distributed to all parties within 5 days of the meeting.

3.2 EARTH FORMS

3.2.1 Earth forms are only permitted for the structured slab at grade including drop panels and localized slab thickenings and steps in slabs. Refer to the geotechnical report for backfill and compaction requirements and environmental report and drawings for vapour barrier requirements. Earth forms for grade beams shall not be used. Hand trim sides and bottom of earth forms. Remove loose soil and water prior to placing concrete.

3.3 FORMWORK

3.3.1 General

3.3.1.1 Erect, support, brace, and maintain formwork to safely support vertical and lateral loads until they can be supported by the structure.

3.3.1.2 All formwork shall be inspected by the Construction Manager prior to the concrete pour to ensure that they have been erected in conformance with the formwork shop drawings.

3.3.1.3 Align joints in formwork and make water-tight. Keep form joints to a minimum.

3.3.1.4 Install void forms in accordance with manufacturer’s recommendations. Protect forms from moisture or crushing prior to concreting.

3.3.2 Construction

3.3.2.1 Form foundation elements sides unless foundation elements are shown to be placed against undisturbed soil.
3.3.2.2 Mark building, grid or other lines on forms to permit the accurate positioning of dowels into concrete elements above and all other reinforcing steel.

3.3.2.3 Construct templates and supports to rigidly fix reinforcing dowels in the forms prior to concreting.

3.3.2.4 Set anchor rods, templates, steel connection units, hardware, and/or other inserts into the forms and secure them rigidly so that they do not become displaced during concreting.

3.3.2.5 In the case of sloping slabs, employ suitable forming procedures compatible with the concrete placing and compaction techniques to ensure that completed concrete has the specified design characteristics, and in particular, to prevent movement of plastic concrete resulting in cracking, loss of bond, etc., and to achieve a surface equivalent to a fine wood float finish suitable to receive the roofing membrane.

3.3.2.6 Where concrete is poured against structural steel beams causing unbalanced horizontal pressures, provide sufficient horizontal support to resist such pressures and to prevent deflection of the steel beams.

3.3.2.7 Application of Form Release Agent

3.3.2.7.1 Apply form release agent in accordance with the manufacturer’s recommendations.

3.3.2.7.2 Apply prior to placement of reinforcement, anchoring devices, and embedded items.

3.3.2.7.3 Do not apply form release agent where concrete surfaces will receive special finishes or applied coverings, which are affected by the agent. Soak inside surface of untreated forms with clean water and keep surfaces covered prior to placement of concrete.

3.3.3 Sleeves, Recesses and Formed Openings

3.3.3.1 Form sleeves, recesses and openings in accordance with reviewed sleeving drawings, except where such items are specified to be formed or sleeved by the appropriate trade.

3.3.3.2 No sleeves, recesses, or openings through structural members shall be formed without the Prime Consultant’s and Structural Consultant’s approval.

3.3.3.3 During cold weather, protect members from damage due to water freezing in confined areas, recesses, sleeves or formed ‘openings’.

3.3.4 Cambers

3.3.4.1 Where shown, camber formwork such that hardened concrete, prior to stripping of forms, is cambered as shown. Maintain beam depth and slab thickness shown on the contract documents.

3.3.5 Curved Surfaces

3.3.5.1 Formwork for curved surfaces shall be constructed as true, smooth uniform radius curves. Faceting of the formwork by means of short chord form segments approximating a curve will not be allowed.
3.3.5.2 Formwork joints shall be securely and tightly constructed and adequately braced to assure the correct curve position and geometry is maintained throughout form construction, concrete placement and concrete curing.

3.4 STRIPPING OF FORMS AND RESHORING

3.4.1 Where forms are stripped from horizontal or sloping members including sloped columns before concrete has reached its specified strength, reshore the members so that they can safely support their own load plus construction loads. In addition, ensure that the stripped member is of sufficient strength to safely carry its own weight over the area stripped out at any instant, together with any superimposed construction loads.

3.4.1.1 Install reshores so that they are supported on members which can safely support the reshore load.

3.4.1.2 As a guide, under specified curing conditions, 70% of the 28 day strength should be attained 7 days after concreting in normal weather and 14 days after concreting in "Cold Weather".

3.4.1.3 Base decision to strip forms upon satisfactory results of 7 day concrete cylinder tests and on site curing conditions or on in situ tests.

3.4.1.4 Stripping and reshoring shall proceed simultaneously so as not to leave an area greater than 80 sq. m. unsupported by either formwork or reshoring at any instant. Install reshores tight to construction above and below so that they will not significantly shorten under load, but take care not to preload the construction below or raise the construction above by over-tightening.

3.4.1.5 Maintain reshoring or formwork in place for a minimum of 28 days or for such longer time as may be required to ensure that the concrete has reached its specified 28 day strength.

3.4.1.6 Do not strip within one and a half bays of a construction joint until new concrete beyond the construction joint has reached 70% of its specified 28 day strength.

3.4.1.7 Side forms for vertical members may be stripped as soon as the concrete is sufficiently strong to stand unsupported and safely resist imposed loads.

3.5 CONSTRUCTION JOINTS

3.5.1 Obtain approval from the Structural Consultant for location and details of construction joints not shown on the contract documents.

3.5.2 For architecturally exposed concrete elements, obtain approval from the Prime Consultant and the Structural Consultant for location and details of construction joints not shown on the contract documents.

3.6 BEARING ASSEMBLIES, NEOPRENE BEARING PADS, SLIDING MOVEMENT JOINT BEARINGS

3.6.1 Remove laitance from the top surface of the bearing ledge and finish with a steel trowel to a dense level surface, to the elevations shown.

3.6.2 Place the bearings in the location required, ensure that they are solidly bedded on the ledge, are set level, and are secured in position.
3.7 QUALITY CONTROL

3.7.1 Implement a system of quality control to ensure that the minimum standards specified herein are attained.

3.7.2 Bring to the attention of the Consultant any defects in the work or departures from the Contract Documents which may occur during construction. The Consultant will decide upon corrective action and give recommendations in writing.

3.7.3 The Consultant's general review during construction and inspection and testing by Independent Inspection and Testing Companies reporting to the Consultant are both undertaken to inform the Owner’s Representative of the Construction Manager's performance and shall in no way augment the Construction Manager's quality control or relieve the Construction Manager of contractual responsibility.

3.8 NOTIFICATION

3.8.1 Prior to commencing significant segments of the work, give the Consultant and Independent Inspection and Testing Companies appropriate notification so as to afford them reasonable opportunity to review the work. Failure to meet this requirement may be cause for the Consultant to classify the work as defective.

3.9 INSPECTION AND TESTING

3.9.1 The Owner will appoint an Independent Inspection and Testing Companies to make inspections or perform tests as the Consultant directs. The Independent Inspection and Testing Companies shall be responsible only to the Consultant, and shall make only such inspections or tests as the Consultant may direct.

3.10 DEFECTIVE MATERIALS AND WORK

3.10.1 Where evidence exists that defective work has occurred or that work has been carried out incorporating defective materials, the Consultant may have tests, inspections or surveys performed, analytical calculations of structural strength, made and the like, in order to help determine whether the work must be corrected or replaced. Tests, inspections or surveys or calculations carried out under these circumstances will be made at the Trade Contractor's expense, regardless of their results, which may be such that, in the Consultant's opinion, the work may be acceptable.

3.10.2 All testing shall be conducted in accordance with the requirements of The Building Code, except where this would, in the Consultant's opinion, cause undue delay or give results not representative of the rejected material in place. In this case, the tests shall be conducted in accordance with the standards given by the Consultant.

3.10.3 Materials or work which fail to meet specified requirements may be rejected by the Consultant whenever found at any time prior to final acceptance of the work regardless of previous inspection. If rejected, defective materials or work shall be promptly removed and replaced or repaired to the satisfaction of the Consultant, at no expense to the Owner.

END OF SECTION
1 General

1.1 SUMMARY

1.1.1 This Section includes requirements for supply and installation of low permeance, high puncture resistant plastic vapour barriers specifically manufactured for contact with ground under concrete slabs on grade, including installation accessories required for a complete installation.

1.2 RELATED REQUIREMENTS

1.2.1 Section 03 20 00 – Concrete Reinforcement: Coordination of reinforcing steel supports having wide bearing base to reduce potential for puncturing underslab vapour barrier materials.

1.2.2 Section 03 30 00 – Cast-in-Place Concrete: Coordination for protection of plastic vapour barriers during concrete placement.

1.3 REFERENCE STANDARDS

1.3.1 American Concrete Institute International (ACI):

1.3.1.1 ACI 302.2R-06, Guide for Concrete Slabs that Receive Moisture-Sensitive Flooring Materials

1.3.2 American Society for Testing and Materials (ASTM):

1.3.2.1 ASTM E1643-11 Standard Practice for Selection, Design, Installation and Inspection of Water Vapour Retarders used in Contact with Earth or Granular Fill under Concrete Slabs

1.3.2.2 ASTM E1745-09, Standard Specification for Water Vapour Retarders Used in Contact with Soil or Granular Fill under Concrete Slabs

1.3.3 Canadian Standards Association (CSA):

1.3.3.1 CAN/CSA A23.1/A23.2-09, Concrete Materials and Methods of Concrete Construction

1.4 ADMINISTRATIVE REQUIREMENTS

1.4.1 Coordination: Coordinate delivery of materials specified in this section to coincide with placement of underslab granular materials and reinforcing steel.

1.4.2 Preconstruction Meetings: Arrange for a pre-installation meeting to confirm installation methods and materials in accordance with Section 01 31 19 – Project Meetings, attended by Construction Manager, installing Subcontractor, Consultant and Owner.

1.5 SUBMITTALS

1.5.1 Provide required information in accordance with Section 01 33 00 – Submittal Procedures.

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

1.5.2.1 Product Data: Submit copies of manufacturer’s product literature indicating specified materials, including listing of accessory materials required for complete installation and manufacturer’s written installation instructions.

1.5.2.2 Samples: Submit two (2), 200 mm x 300 mm sheets of vapour barrier material proposed for use on project for verification of specification requirements.
1.5.3 Sustainable Design Submittals: Coordinate project sustainable design requirements with Section 01 35 31 – LEED Special Project Procedures.

1.6 DELIVERY, STORAGE AND HANDLING

1.6.1 Delivery and Acceptance Requirements: Deliver materials to site in manufacturer's original, unopened containers and packaging, with labels clearly identifying product name and manufacturer.

1.6.2 Storage and Handling Requirements: Store materials in a clean, dry area in accordance with manufacturer's instructions; protect materials during handling and application to prevent damage or contamination.

2 Products

2.1 MANUFACTURERS

2.1.1 Acceptable Materials Manufacturers: Subject to compliance with requirements specified in this Section; where multiple listings of manufacturers occur, use any of the following listed manufacturers' products in accordance with Section 01 62 00 – Product Options including the following:

2.1.1.1 Raven Industries
2.1.1.2 Stego Industries LLC
2.1.1.3 W.R. Meadows

2.1.2 Substitutions: Consultant may consider additional manufacturers having similar products to Acceptable Materials Manufacturers listed above during the construction period, provided they meet the performance requirements established by the named products and provided they submit requests for substitution in accordance with Section 01 25 00 – Substitution Procedures before starting any work of this Section:

2.1.2.1 Do not use substitute materials to establish Bid Price.
2.1.2.2 Substitutions that appear as a part of the project without review and acceptance by the Consultant will be rejected, and replaced with one of the specified materials.

2.2 MATERIALS

2.2.1 Plastic Sheet Moisture Suppression Membrane: High density, puncture resistant plastic sheet membrane meeting requirements of ASTM E1745, and as follows:

2.2.1.1 Vapour Permeance: Nominal ≤ 0.01 Perm maximum
2.2.1.2 Tensile Strength and Puncture Resistance: ASTM E1745 Class C Minimum
2.2.1.3 Thickness: Minimum 250 μm (10 mil) in accordance with CSA A23.1 requirements.
2.2.1.4 Acceptable Materials:

2.2.1.4.1 Raven VapourBlock VB10
2.2.1.4.2 Stego Wrap 10 mil
2.2.1.4.3 WRM Perminator 10 mil

2.2.2 Accessory Materials: Provide manufacturer's required seam tape, pipe boots and vapour proofing mastic forming a complete system in accordance with CAN/CSA A23.1 and ASTM E1643.
3 Execution

3.1 EXAMINATION

3.1.1 Verification of Conditions: Verify that base materials are placed level and compacted, and have been accepted by the Consultant before starting installation of products specified in this Section

3.1.1.1 Installation of products specified in this Section will denote acceptance of site conditions.

3.2 INSTALLATION

3.2.1 Install vapour barrier in accordance with manufacturer’s written instructions and ASTM E1643, and generally as follows:

3.2.1.1 Unroll vapour barrier with the longest dimension parallel to direction of concrete placement.
3.2.1.2 Lap vapour barrier over footings and seal to foundation walls.
3.2.1.3 Overlap joints and seal with manufacturer’s required tape.
3.2.1.4 Seal penetrations including pipe and conduit risers in accordance with manufacturer’s written instructions.
3.2.1.5 Make no additional penetrations except as required for placing of reinforcing steel and permanent utilities.

3.2.2 Repair damaged areas by cutting patches of vapour barrier membrane; sized to overlap damaged area a minimum of 150 mm to each side of puncture; and tape all sides using manufacturer’s required tape.

END OF SECTION
1 General

1.1 SUMMARY

1.1.1 This Section includes requirements for supply and installation of:

1.1.1.1 Cast-in-place safety stair nosings in concrete work for stairs and landings.
1.1.1.2 Indicated on Drawings as “Safety Tread Inserts”.

1.2 RELATED REQUIREMENTS

1.2.1 Section 03 30 00 – Cast-In-Place Concrete: Casting accessory components into concrete assemblies.

1.3 REFERENCE STANDARDS

1.3.1 American Society for Testing and Materials (ASTM):

1.3.1.1 ASTM B 221-12A – Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Shapes and Tubes

1.4 SUBMITTALS

1.4.1 Provide required information in accordance with Section 01 33 00 – Submittal Procedures.

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

1.4.2.1 Shop Drawings: Submit shop drawings showing complete fabrication details for all stair nosings, including required anchorage to surrounding construction.
1.4.2.2 Product Data: Submit manufacturer’s standard data sheets and installation instructions describing components including materials, dimensions, relationship to adjacent construction and attachments.
1.4.2.3 Sample: Submit three (3) 150 mm long samples of specified system.

1.4.3 Sustainable Design Submittals: Coordinate project sustainable design requirements with Section 01 35 31 - LEED Special Project Procedures and Section 01 35 31A - LEED Material Information Sheet for LEED Submittals.

1.5 QUALITY ASSURANCE

1.5.1 Manufacturer shall have a minimum of ten (10) years of experience in the fabrication of stair nosing systems.

1.5.2 Installer with not less than three (3) years of successful experience in the installation of systems similar to those required by this project and acceptable to the manufacturer of the system.

1.6 DELIVERY, STORAGE AND HANDLING

1.6.1 Store components in original containers in a clean, dry location.
1.7 SITE CONDITIONS

1.7.1 Established Dimensions: Establish dimensions and proceed with ordering materials 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; allow for trimming and fitting.

1.8 WARRANTY

1.8.1 Submit manufacturer’s warranty that materials furnished will perform as specified for a period of not less than one (1) year when installed in accordance with manufacturer’s recommendations.

2 Products

2.1 MANUFACTURERS - ABRASIVE NOSINGS FOR CONCRETE STAIRS

2.1.1 Basis-of-Design Products: Products named in this Section were used as the basis-of-design for the project; additional manufacturers offering similar products may be incorporated into the work of this Section [provided they meet the performance requirements established by the named products and provided they submit requests for substitution in accordance with Section 01 62 00 – Product Options.

2.1.1.1 Basis-of-Design Product: American Safety Tread, Type 3311

2.1.2 Acceptable Materials Manufacturers: Subject to compliance with requirements specified in this Section, manufacturers offering products that may be incorporated into the Work include; but are not limited to, the following:

2.1.2.1 Balco P-200
2.1.2.2 Wooster Products, Inc. Type 121

2.1.3 Substitutions: Consultant may consider additional manufacturers having similar products to Acceptable Materials Manufacturers listed above during the construction period, provided they meet the performance requirements established by the named products and provided they submit requests for substitution in accordance with 01 25 00 – Substitution Procedures before starting any work of this Section:

2.1.3.1 Do not use substitute materials to establish Bid Price.
2.1.3.2 Substitutions that appear as a part of the project without review and acceptance by the Consultant will be rejected, and replaced with one of the specified materials.

2.2 MATERIALS

2.2.1 Aluminum: ASTM B 221, alloy 6063-T5 for extrusions, heat treated.

2.2.2 Abrasive Filler: Consisting of mixture of aluminum oxide and silicon carbide granules in an epoxy matrix.

2.2.3 Integral continuous wing anchors or standard anchors.

2.3 FABRICATION

2.3.1 Provide anchors and accessories necessary for complete installation.

2.3.2 Fabricate solid surface abrasive tread 10 mm thick by 51 mm wide.
2.3.3 Fabricate stair nosings with the depth of nose to measure underside 13 mm.

2.3.4 Provide Black abrasive tread inserts.

2.3.5 Provide 50 mm margin at ends of stair ends.

2.3.6 Package components with cast-in-concrete anchors 75 mm from each end and at 305 mm centres.

2.3.7 Back paint aluminum with bituminous paint prior to installation.

2.3.8 Acceptable Products

2.4 FINISHES

2.4.1 Aluminum sub-channels: Mill finish.

2.4.2 Abrasive Filler: Black

3 Execution

3.1 INSTALLATION

3.1.1 Install non-slip nosings for concrete treads and landing in accordance with manufacturer’s written instruction and product data, set plumb, level and rigid.

3.2 CLEANING

3.2.1 Clean exposed surfaces as recommended by the manufacturer.

3.3 PROTECTION

3.3.1 Protect the finished work from damage by work of other Sections during the remainder of the construction period.

END OF SECTION
1 General

1.1 WORK INCLUDED

1.1.1 Section 01 31 19 - Project Meetings
1.1.2 Section 01 33 00 - Submittal Procedures
1.1.3 Section 01 33 50 - Delegated Design Submittals
1.1.4 Section 01 35 31 - LEED Special Project Procedures
1.1.5 Provide all labour, materials, plant and equipment to complete the steel reinforcement work indicated on the drawings and specified herein.

1.2 RELATED SECTIONS

1.2.1 Concrete Forming and Accessories, Section 03 10 00.
1.2.2 Cast-in-Place Concrete, Section 03 30 00.
1.2.3 Precast Architectural Concrete, Reinforcement for precast concrete panels, Section 03 45 00.
1.2.4 Masonry Anchorage and Reinforcement: Reinforcement for masonry, Section 04 04 15.
1.2.5 Bored Concrete Piles, Section 31 63 23.

1.3 REFERENCE STANDARDS, CODES AND ACTS

1.3.1 Conform to the Alberta Building Code 2006 (The Building Code) as amended by all subsequent Alberta Regulations issued to the date of this specification] and applicable acts of authorities having jurisdiction.

1.3.1.1 ACI 318-11 – Building Code Requirements for Structural Concrete.
1.3.1.2 ASTM A1064/A1064M-14 - Standard Specification for Carbon-Steel Wire and Welded Wire Reinforcement, Plain and Deformed, for Concrete.
1.3.1.3 ASTM A123/A123M-13 Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products.
1.3.1.5 ASTM A184/A184M-06 (2011) - Fabricated Deformed Steel Bar Mats for Concrete Reinforcement.
1.3.1.6 ASTM A704/A704M-06 (2011) - Welded Steel Plain Bar or Rod Mats for Concrete Reinforcement.
1.3.1.7 ASTM A767/A767M-09 Zinc-Coated (Galvanized) Steel Bars for Concrete Reinforcement.
1.3.1.8 ASTM A775/A775M-07b(2014) - Epoxy-Coated Reinforcing Steel Bars.
1.3.1.9 A780/A780M Practice for Repair of Damaged and Uncoated Areas of Hot-Dip Galvanized Coatings.
1.3.1.10 ASTM D3963/D3963M-01(2007) - Fabrication and Jobsite Handling of Epoxy-Coated Steel Reinforcing Bars.

1.3.1.11 CSA A23.1-09/ CSA A23.2-09 - Concrete Materials and Methods of Concrete Construction/Test Methods and Standard Practices for Concrete

1.3.1.12 CSA A23.3-04 (R2010) - Design of Concrete Structures.

1.3.1.13 CSA S304.1-04 (R2010) - Design of Masonry Structures

1.3.1.14 CSA A371-04 (R2009) - Masonry Construction for Buildings

1.3.1.15 CAN/CSA G30.18-09 - Carbon Steel Bars for Concrete Reinforcement.

1.3.1.16 CAN/CSA G40.20-134/G40.21-134 - General Requirements for Rolled or Welded Structural Quality Steel/Structural Quality Steel.

1.3.1.17 CAN/CSA G164-M92 (R2003) Hot Dip Galvanizing of Irregularly Shaped Articles.

1.3.1.18 CSA W186-M1990 (R2012) Welding of Reinforcing Bars in Reinforced Concrete Construction.


1.3.1.19.1 Where there are differences between the specifications and drawings and the codes, standards, or acts, the most stringent shall govern.

1.3.1.19.2 Standards referenced by the Standards noted above are to apply even if they are not included in the list. Where such reference is made, it shall be to the latest edition and revision published.

1.4 QUALIFICATIONS

1.4.1 Trade Contractors responsible for welding reinforcement shall be certified by the Canadian Welding Bureau under the requirements of W186.

1.5 SAMPLES AND ASSISTANCE

1.5.1 Supply samples of the following materials, the cost of which shall be paid for by this trade: Reinforcing steel designated by the Consultant from steel shipped to the site.

1.5.1.2 Mechanical splices designated by the Consultant.

1.5.1.3 Welded reinforcement splices designated by the Consultant

1.5.1.4 Support accessories (chairs, bolsters, spacers) identified by the Consultant

1.5.2 Replace samples removed from the site as necessary

1.5.3 Inform the Consultant when fabrication will be undertaken. Allow Consultant to access the fabricator’s plant during fabrication process.

1.6 SUBMITTALS

1.6.1 Submit submittals in accordance with Section 01 33 00 – Submittal Procedures.
1.6.2 Sustainable Design Submittals: Coordinate project sustainable design requirements with Section 01 35 31 – LEED® Special Project Procedures.

1.6.3 Shop Drawings for Reinforcement

1.6.3.1 Reproduction of the structural drawings, to serve as shop drawings, will be permitted and is subject to separate agreement between the Consultant and the Construction Manager. Any costs associated with the preparation of the structural drawings for use by the Trade Contractor or Construction Manager shall be paid for by this section. Refer to Section 01 31 26 – Electronic Communications Protocol for BIM.

1.6.3.2 Prepare reinforcement shop drawings and bar lists taking into account all openings and recesses shown on the architectural, structural, mechanical and electrical drawings, and on the sleeving shop drawings prepared by other trades.

1.6.3.3 Prepare shop drawings to a minimum scale of 1:50 or larger as deemed necessary by the Trade Contractor. Shop drawings shall be clear and complete and shall allow placement of reinforcement without reference to contract documents.

1.6.3.4 Unless noted otherwise, on all shop drawings provide adequate space immediately above the drawings title block for a Consultant’s Shop Drawing review stamp. Where requested by the Consultant, the stamp is to be inserted by this section directly into the shop drawing prior to submission. The stamp shall be positioned in the same location on each shop drawing, and in no case shall the allocated space be less than 63 x 75 mm (2.5 × 3”). Request the details of these requirements from the Consultant no less than 2 weeks before the commencement of shop drawings.

1.6.3.5 Detail reinforcement in accordance with the contract documents, CSA A23.1, and CSA S304.1 and detailing standards in RSIC Manual of Standard Practice.

1.6.3.6 As a minimum, the shop drawings shall show the following:

1.6.3.6.1 Bar sizes, spacing, lap lengths, location and quantities of reinforcement, welded wire fabric and mechanical splices.

1.6.3.6.2 Bar spacing requirements and provisions for spacers where required.

1.6.3.6.3 Locations where reinforcement is considered to be bundled, as defined by CSA A23.1.

1.6.3.6.4 Identification of each bar with a code mark corresponding to the bar lists.

1.6.3.6.5 Detail sections to fully illustrate placement of concrete reinforcement at all areas such as openings, change of levels, spandrels, stairs and wherever else required.

1.6.3.6.6 Large scale detail concrete sections at areas of steel concentrations such as at all concrete to structural steel intersections, beam to girder intersections, curved girders, intersection of beams to columns, or wherever else required.
1.6.3.6.7 Placing sequence for areas with multiple layers of reinforcement.

1.6.3.6.8 Minimum clearances between reinforcement and minimum concrete cover.

1.6.3.6.9 Location, number and type of support accessories, including support bars suitably sized and spaced to rigidly support the weight of reinforcement and imposed loads during construction. Where 10M top bars and welded wire fabric are shown, provide adequate supports to ensure that these bars are not bent or displaced prior to or during the concreting operation.

1.6.3.6.10 Location and embedment of dowels.

1.6.3.6.11 The size, location, and elevation of mechanical splices, as well as required installation procedures.

1.6.3.7 Provide dowels for reinforced masonry walls (load bearing or non-load bearing) from slabs and walls. Coordinate location of walls with architectural drawings.

1.6.3.8 Submit code marks or symbols used on reinforcement of each manufacturer so that Consultant may identify grades and sizes of reinforcement.

1.6.4 Certificates

1.6.4.1 Reinforcement from Canadian Manufacture: Provide Consultant with a certified copy of the mill test reports for reinforcing steel showing physical and chemical analysis for weldable reinforcement, include verification of its weldability. Reports to be submitted a minimum 4 weeks prior to commencing fabrication.

1.6.4.2 Reinforcement from Non-Canadian Manufacture: Provide test data from a Canadian Testing Laboratory proving that each size and grade of reinforcement proposed meets the requirements of the Contract Documents. Reinforcement approved for use by the Consultant shall be identified in a manner suitable to the Consultant. Only steel that has been approved will be accepted on job site.

1.6.5 As-Built Drawings

1.6.5.1 Mark on a complete set of final drawings any changes, additions, or deletions that occur during construction as a result of the Trade Contractor’s work, change orders, or for any other reason.

1.6.5.2 For all shop drawings marked “Reviewed as Noted” or “Revise and Resubmit”, update and submit a record set of these drawings at the completion of the structural work. Ensure that these drawings reflect the changes and are coordinated with the final drawings noted above.

1.7 TOLERANCES

1.7.1 Perform fabrication and setting so that completed work will be within the tolerances set out in CSA A23.1.
1.7.2 These tolerances are acceptable with regard to structural requirements. Interfacing tolerances may not be compatible with the above. Review and coordinate interfacing tolerances so that the various elements come together properly.

2 Materials

2.1 REINFORCEMENT

2.1.1 Reinforcing Steel, Deformed: Canadian manufacture to CAN/CSA-G30.18, billet steel, Grade 400R regular, 400W weldable bars, and epoxy coated.

2.1.2 Epoxy Coated Reinforcement: To ASTM A775/A775M and D3963/D3963M.

2.1.3 Galvanized Reinforcement: Galvanized to ASTM A767/A767M, Coating to conform to Class II (610 g/sq m; 2 oz/sq ft).

2.2 MECHANICAL SPLICES

2.2.1 Mechanical Tension Splices: Type 2 mechanical splices, per CSA A23.3, LENTON Couplers, complete with bar end protectors and coupler end protectors, as supplied by Erico Canada Inc or approved alternative.

2.2.2 Mechanical Compression Splices: BAR-LOCK mechanical coupler system manufactured by Dayton/Richmond Concrete Accessories, End-Bearing Compression Splice SPEED-SLEEVE as supplied by Erico Canada Inc or approved alternative.

2.3 MECHANICAL ANCHORS

2.3.1 Mechanical anchor to structural steel plate: LENTON C2/C3J Weldable Half-Couplers as supplied by Erico Canada Inc or approved alternative.

2.3.2 Mechanical reinforcing steel terminator: LENTON TERMINATOR D14 supplied by Erico Canada Inc or approved alternative.

2.4 ACCESSORIES

2.4.1 Minimum gauge as required for support of stability of steel reinforcement during reinforcement placement and concreting operation.

2.4.2 Chairs, Bolsters, Bar Supports, Spacers: Sized and shaped for strength and support of reinforcement during concrete placement conditions including load bearing pad on bottom to prevent vapour barrier puncture.

2.4.3 Special Chairs, Bolsters, Bar Supports, Spacers Adjacent to Weather Exposed Concrete Surfaces: Stainless Steel type; size, and shape as required.

3 Execution

3.1 FABRICATION

3.1.1 Fabricate reinforcement in accordance with:

3.1.1.1 CSA A23.1.


3.1.1.3 CSA-W186 Welded reinforcement.
3.1.2 Locate reinforcement splices not indicated on drawings, at point of minimum stress. Review location of splices with Consultant. Stagger splices to minimize cross sectional area at any one point in beams and walls.

3.1.3 Unless noted otherwise, bend reinforcement once only and at room temperature of 18°C, do not straighten or rebend reinforcement and do not field bend reinforcement. Do not use bars with kinks or bends not shown on the drawings. Replace bars which develop cracks or splits.

3.1.4 Galvanize reinforcement after bar fabrication.

3.1.5 Prior to galvanizing, the material shall have all grease, dirt, mortar, mill scale, injurious rust (rust which is not firmly bonded to the steel), or any other foreign substances removed.

3.1.6 Bending of galvanized reinforcing bars in the field greater than 10 degrees shall not be allowed.

3.1.7 Pins around which galvanized reinforcing bars are bent shall have a minimum diameter as follows:

3.1.7.1 For 10M to 30M inclusive, 8 bar diameters.

3.1.7.2 For 35M or greater, 10 bar diameters.

3.1.8 All surfaces of sheared ends of bars as well as cracking and other visible damage or deterioration of the hot-dip galvanizing as a result of handling or installation operations, or any other causes, shall be repaired with ZINGA or approved equal formulation, in accordance with ASTM A780/A780M. All field-applied galvanized coatings shall be applied in accordance with the manufacturer’s recommendations and as directed by the Consultant. Repairs to the reinforcing bars shall be done prior to placing the bars in forms.

3.1.9 Provide threaded reinforcing steel whenever a mechanical threaded splice or anchor is specified in the structural drawings. Thread reinforcing in the shop or field. Protect threaded bar ends against damage during shipping and handling.

3.2 PLACEMENT

3.2.1 Prior to placing concrete, place support and secure reinforcement against displacement to CSA 23.1 and as indicated on reviewed placing drawings.

3.2.2 Do not displace or damage vapour barrier during reinforcement placement.

3.2.3 Accommodate placement of formed openings.

3.2.4 Maintain concrete cover as noted on the Contract Documents.

3.2.5 Where continuous drop panels or slabs thickenings are noted on the drawings, place bottom slab reinforcement in the bottom of the continuous drop panel or slab thickening, unless noted otherwise on the drawings.

3.2.6 Provide splices only where shown on the Contract Documents or reviewed shop drawings. No other splices will be permitted without approval of the Consultant.

3.2.7 Additional Requirements for Epoxy Coated Reinforcement
3.2.7.1 All systems for handling, transporting, and storing coated bars shall be such that the epoxy coating shall not be damaged. Do not drop or drag bars. Store on suitable non-metallic supports.

3.2.7.2 During and after the placement of coated bars, repair all damaged portions of the coating. Any damaged accessories shall also be prepared. The Consultant may require that damaged bars be replaced instead of repaired.

3.2.7.3 The cutting of coated bars by burning will not be permitted.

3.2.7.4 Do not weld coated bars.

3.2.8 Lap ends and sides of welded wire fabric as noted on the drawings, but in no case less than 300 mm (12”).

3.2.9 Additional Requirements for Mechanical Splicing of Reinforcement

3.2.9.1 Tension Splices

3.2.9.1.1 Unless noted otherwise, mechanical tension splices shall develop 120% of the specified yield strength, but not less than 110% of the actual yield strength, of the reinforcement being spliced or of the smaller bar if the bars spliced are of different sizes.

3.2.9.1.2 In each concrete member, unless otherwise indicated, mechanical tension splices in adjacent bars shall be staggered by at least 750 mm (2'-6”).

3.2.9.2 Compression Splices

3.2.9.2.1 Non End-Bearing Mechanical Splices

3.2.9.2.1.1 Unless noted otherwise, mechanical compression splices shall develop 120% of the specified tensile yield strength, but not less than 110% of the actual tensile yield strength of the reinforcement being spliced or of the smaller bar, if the bars spliced are of different sizes.

3.2.9.2.1.2 In each concrete member, stagger splices of adjacent bars by at least 750 mm (2'-6”).

3.2.9.2.2 End-Bearing Splices

3.2.9.2.2.1 End bearing splices shall develop the ultimate compressive strength of the reinforcing bars spliced.

3.2.9.2.2.2 Accurately saw cut the end bearing surfaces of all bars to be spliced 90 degrees to the axis of the bar with a tolerance of 1-1/2 degrees.

3.2.9.2.2.3 In setting the bars, rotate until the angle between bearing surfaces is at a minimum, but not more than 3 degrees of full bearing.
3.3 ADDITIONAL REQUIREMENTS FOR ARCHITECTURAL CONCRETE

3.3.1 Strictly maintain concrete covers and bar spacing clearances for architectural concrete. Place spacers regularly and squarely against forms. Submit spacer type, spacing, and provide a spacer sample for review by Prime Consultant and Structural Consultant.

3.3.2 The location of spacers shall not constrict adjacent inserts which may impede the placing of concrete.

3.3.3 The cover to reinforcement shall be taken from the deepest penetration of arises or reglets.

3.3.4 Take particular care not to damage form sheathing surfaces during installation of reinforcement.

3.4 QUALITY CONTROL

3.4.1 Provide a system of quality control to ensure that the minimum standards specified in the Contract Documents are attained.

3.4.2 Bring to the attention of the Consultant any defects in the work or departures from the Contract Documents which may occur during Construction. The Consultant will decide upon corrective action and give recommendations in writing.

3.4.3 The Consultant’s general review during construction and inspection and testing by the Independent Inspection and Testing Companies are both undertaken to inform the Owner of the Construction Manager’s performance and shall in no way augment the Construction Manager’s quality control or relieve the Construction Manager of their contractual responsibilities with respect to quality control

3.4.4 Prior to commencing significant segments of the work, give the Consultant and Independent Inspection and Testing Companies appropriate notification so as to afford them reasonable opportunity to review the work. Failure to meet this requirement may be cause for the Consultant to classify the work as defective.

3.5 INSPECTION AND TESTING

3.5.1 The Owner will appoint the Independent Inspection and Testing Companies to make inspections or perform tests as the Consultant directs. The Independent Inspection and Testing Companies shall be responsible only to the Consultant, and shall make only such inspections or tests as the Consultant may direct.

3.5.2 When defects are revealed, the Consultant may request, at the Trade Contractor’s expense, additional inspection or testing to ascertain the full extent of the defect.

3.5.3 Tests of Reinforcing Steel by Independent Inspection and Testing Companies.

3.5.3.1 A series of specimens for each grade and size of reinforcing steel contained in any 100 tonnes (100 tons) for concrete reinforcement may be tested. A series of tests will include two bars for each test required of each size and grade of steel used. Reinforcing steel tests will be made in accordance with CSA Standards G30 Series.

3.5.3.2 Nondestructive tests may be made on welded reinforcement.
3.5.3.3 Tension tests to destruction may be performed on approximately 5% of mechanical splices.

3.6 DEFECTIVE MATERIALS AND WORK

3.6.1 Where evidence exists that defective work exists or that work has been carried out incorporating defective materials, the Consultant may have tests, inspections or surveys performed, analytical calculations of structural strength made, and the like, in order to help determine whether the work must be replaced. Tests, inspections or surveys or calculations carried out under these circumstances will be made at the Trade Contractor’s expense, regardless of their results, which may be such that, in the Consultant’s opinion, the work may be acceptable.

3.6.2 All testing shall be conducted in accordance with the requirements of The Building Code, except where this would, in the Consultant’s opinion, cause undue delay or give results not representative of the rejected material in place. In this case, the tests shall be conducted in accordance with the standards given by the Consultant.

3.6.3 Materials or work which fail to meet specified requirements may be rejected by the Consultant whenever found at any time prior to final acceptance of the work regardless of previous inspection. If rejected, defective materials or work shall be promptly removed and replaced or repaired to the satisfaction of the Consultant, at no expense to the Owner.

END OF SECTION
1 General

1.1 WORK INCLUDED

1.1.1 Section 01 31 19 - Project Meetings
1.1.2 Section 01 33 00 – Submittal Procedures
1.1.3 Section 01 33 50 - Delegated Design Submittals
1.1.4 Section 01 35 31 - LEED Special Project Procedures
1.1.5 Provide all labour, materials, plant and equipment to complete the cast-in-place concrete work indicated on the drawings and specified herein.

1.2 RELATED WORK SPECIFIED ELSEWHERE

1.2.1 Concrete Formwork and Falsework, Section 03 10 00.
1.2.2 Concrete Reinforcement, Section 03 20 00.
1.2.3 Architecturally Exposed Concrete, Section 03 33 00.
1.2.4 Concrete Floor Finishing, Section 03 35 00.
1.2.5 Structural Steel, Section 05 12 00.
1.2.6 Common Work Results for Earthwork, Section 31 05 00.
1.2.7 Bored Concrete Piles, Section 31 63 23.

1.3 REFERENCE STANDARDS, CODES AND ACTS

1.3.1 Conform to the Alberta Building Code (ABC 2014) (The Building Code) as amended by all subsequent Alberta Regulations issued to the date of this specification and applicable acts of authorities having jurisdiction.

1.3.1.1 CSA A23.1-14/ CSA A 23.2-14 - Concrete Materials and Methods of Concrete Construction/Test Methods and Standard Practices for Concrete

1.3.1.2 CSA A23.3-04 (R2010) - Design of Concrete Structures

1.3.1.3 CSA A3000-13 - Cementitious Materials Compendium

1.3.2 Where there are differences between the specifications and drawings and the codes, standards or acts, the most stringent shall govern.

1.3.3 Standards referenced by the Standards noted above are to apply even if they are not included in the list. Where such reference is made, it shall be to the latest edition and revision published.

1.4 TOLERANCES

1.4.1 Perform placing operations so that completed work will be within the tolerances set out in CSA A23.1.

1.4.2 Variations in building lines which result in extension of the building over lot lines or restriction lines will not be permitted.
1.4.3 These tolerances are acceptable with regard to structural requirements. Interfacing tolerances may not be compatible with the above. Review and coordinate interfacing tolerances so that the various elements come together properly.

1.5 QUALIFICATIONS

1.5.1 The ‘foreperson’ or ‘lead hand’ supervising the placement, consolidation, finishing and curing of the concrete shall demonstrate finishing experience from past similar projects and as a minimum 5 years of regular full-time work.

1.5.2 The concrete supplier shall be certified by the Alberta Ready-Mixed Concrete Association (ARMCA) and shall hold a current “Certificate of Ready Mixed (or Mobile Mix) Concrete Production Facilities” as issued by ARMCA.

1.5.3 Where concrete toppings are specified, the concrete flooring Trade Contractor shall assume responsibility for all aspects of the topping construction. This will include, but is not limited to the base course or substrate preparation, review of concrete mix design, concrete supply, bonding agents, placing, finishing and curing etc.

1.6 CONCRETE MIX DESIGN

1.6.1 Design of Concrete Mixes

1.6.1.1 Concrete mixes are to be designed in accordance with the Performance Alternative outlined in CSA A23.1. The mixes are to be designed such that they will be homogeneous, uniformly workable, readily place able into corners and angles of forms and around reinforcement by methods of placing and consolidation employed on the work, but without permitting materials to segregate or excessive free water to collect on the surface. The concrete, when hardened, shall have the qualities specified.

1.6.1.2 When designing the concrete mixes, the supplier shall be cognizant of the curing requirements outlined in the contract documents and CSA A23.1. If a particular concrete mix requires curing in addition to that specified, the Trade Contractor shall be responsible for providing this additional curing.

1.6.1.3 Specified Strength: As called for on drawings.

1.6.1.4 Fly Ash: The use of fly ash in concrete that will be exposed to view is permissible provided that the specified concrete colour is achieved.

1.6.1.5 Metakaolin: The use of metakaolin in architecturally exposed concrete columns is subject to review and acceptance by the Prime Consultant and Structural Consultant.

1.6.1.6 Use of calcium chloride is not permitted.

1.6.1.7 Coordinate the mix designs for suitability with concrete pumping as required by the Trade Contractor.

1.6.1.8 Design concrete mixes so they maintain their workability based on assumed minimum discharge and placing rates as specified by the Trade Contractor.

1.6.2 Toppings

1.6.2.1 Design mix in accordance with requirements of contract documents and provisions of CSA A23.1.
1.6.2.1 Low-shrinkage concrete. Concrete shall be supplied where noted on the construction documents. Low-shrinkage concrete shall be prequalified by testing in accordance with the Standard, except that drying in air at 50% RH shall commence after a total of 7d (7day) of wet curing, and the initial comparator reading (zero-day reading) shall be taken at the end of the wet curing period immediately before the commencement of drying. The shrinkage after 28d of drying (at the concrete age of 35d) shall be not greater than 0.040% unless otherwise noted. Provide testing data or history of shrinkage performance for review in mix design submittals.

1.6.2.2 All concrete toppings to meet 20 MPa minimum in 28 days and able to be pumped in accordance with Construction Manager’s requirements. Refer to the Construction Manager for stripping information.

1.7 TRIAL BATCHING PROGRAM

1.7.1 A detailed trial batching program shall be carried out as indicated below for architecturally exposed concrete elements:

1.7.2 The purpose of the program is to allow the concrete supplier to demonstrate that their proposed concrete mix design meets the requirements of the contract documents.

1.7.3 At least four weeks prior to the trial batching program taking place, the concrete supplier shall submit a detailed plan outlining the methodology, extent of concrete quality testing, schedule and the like for the trial batching program.

1.7.4 The trial batching program including all necessary tests shall be carried out by the concrete supplier at no additional expense to the Owner.

1.7.5 The trial batching program and all related tests are to be witnessed by an independent inspection and testing company, appointed by the Owner.

1.7.6 The concrete supplier shall allow free access to representatives of this company to make checks and any additional tests they feel are necessary, on behalf of the Owner.

1.7.7 The trial batching program shall involve the production of at least 7 m³ of the required concrete.

1.7.8 The time from batching to discharge shall be equivalent to the typical haul time that is anticipated between the batching plant and the job site. In addition, a second set of tests shall be performed on a portion of the mix discharged at the maximum time permitted during construction.

1.7.9 Trade Contractor shall submit a list of proposed locations where the trial batch will be discharged.

1.7.10 Trial Batches – HVSCM Concrete

1.7.10.1 Laboratory trial mixes, followed by full-size batch tests (as described above) shall be made to demonstrate that the materials, mix formula, and production techniques chosen will produce concrete meeting the requirements for the project. The following properties, as applicable to the work, shall be evaluated in the trial: workability, air content, finishability, setting time, temperature development, hardened air-void parameters, strength, and durability. If recent and adequate test data exists, the Owner may waive this requirement. If materials or placing conditions change significantly, further trials will in some cases be necessary.
1.8 HIGH STRENGTH CONCRETE

1.8.1 High strength concrete is all concrete with a compressive strength of 70 MPa and greater. Refer to drawings for specified strengths and locations of high strength concrete elements.

1.8.2 Concrete mixes shall be designed by the concrete supplier and submitted for certification to the independent inspection company.

1.8.2.1 Prequalification of concrete mix designs shall consist of laboratory testing carried out by the independent inspection company and trial batches carried out by the concrete supplier with testing carried out by the independent inspection company. All prequalification testing shall be carried out prior to the placing of any class of high strength concrete in the structure.

1.8.2.2 The mix design used for the prequalification testing shall be either:

1.8.2.2.1 The mix design proposed for all classes of high strength concrete specified for this contract; or

1.8.2.2.2 An alternative mix design agreed with the independent inspection company.

1.8.3 Prequalification trial batches carried out by the concrete supplier, at no expense to the Owner, are to demonstrate satisfactory uniformity in batching and mixing high strength concrete and to demonstrate that the proposed high strength concrete mix design will meet the requirements of the strength specification.

1.8.4 Trial batches are to be conducted as outlined under the Trial Batching Program requirements noted above.

1.8.5 Prequalification trial batches shall be witnessed and tested by the appointed independent inspection company. The supplier shall allow free access to representatives of this company to make checks and tests and witness the trials on behalf of the owner.

1.9 SAMPLES AND ASSISTANCE

1.9.1 Concrete Test Cylinders

1.9.1.1 Supply materials for concrete test cylinders, the cost of which shall be paid for by this Section.

1.9.1.2 Cooperate in the execution of the concrete quality testing program. Furnish concrete required, protect specimens against injury and loss, assist in the sampling and storage of specimens, as required.

1.9.1.3 Sample concrete, cast cylinders and store in accordance with CSA A23.1 where directed by the Structural Consultant.

1.9.1.4 For all concrete compressive strength tests, 100 x 200mm (4" x 8") cylinders shall be used.

1.9.1.5 In accordance with requirements of CSA A23.1, provide storage facilities with continuous power supply for site storage container for test cylinders.

1.9.1.6 Provide sufficient field curing storage facilities so that cylinders representing the various areas can be safely stored in locations representing the curing
conditions for those areas. Move the field cured cylinder storage facilities from area to area as the work progresses.

1.9.2 Soil Inspection

1.9.2.1 Assist the geotechnical consultant in making their inspections or tests.

1.10 SUBMITTALS

1.10.1 Submit submittals in accordance with Section 01 33 00 – Submittal Procedures.

1.10.2 Sustainable Design Submittals: Coordinate project sustainable design requirements with Section 01 35 31 – LEED® Special Project Procedures.

1.10.3 Surveys

1.10.3.1 Submit surveys in accordance with Section 03 10 00, Concrete Forming and Accessories.

1.10.4 Certificates

1.10.4.1 The concrete supplier shall submit a current “Certificate of Ready Mixed (or Mobile Mix) Concrete Production Facilities,” as issued by the ARMCA.

1.10.4.2 Prior to beginning work and when any change in materials or source of supply is proposed, provide the following certificates prepared by an independent inspection company;

1.10.4.2.1 Certification that all raw materials used in the production of concrete proposed for the work comply with the requirements of the specifications and CSA A23.1.

1.10.4.2.2 Certification that compressive strength, slump, entrained air content, and other specified properties will be met, using the proposed mixes.

1.10.4.2.3 Certification that classes of exposure C-1, A-1 and C-XL will meet the 56 day limits specified in CSA A23.1 for the rapid chloride permeability test, using the proposed mixes.

1.10.4.2.4 Certification that the chloride ion content in the concrete, before exposure, shall not exceed 0.06% by mass of the cementing materials.

1.10.4.3 The concrete supplier shall submit representative chloride permeability test data distributed over a period of 56 days for concrete exposure classes C-1, A-1 and C-XL, with and without calcium nitrite corrosion inhibitor or any other admixture containing ionic salts.

1.10.4.4 The concrete supplier shall submit their most current “Concrete Mix Design Statistical Analysis” records for the proposed concrete plant. These records shall indicate the concrete supplier’s average strength, standard deviation, coefficient of variation and target strength, as per the requirements of CSA-A23.1 and ARMCA.

1.10.4.5 The concrete supplier shall submit current Seals of Special Concrete Quality for all concrete mixes noted below:

1.10.4.5.1 80 MPa Concrete
1.10.5 Concrete Mix Designs

1.10.5.1 Well in advance of the supply of concrete to the project submit, using the standard ARMCA form for Concrete Mix Design Submissions, all concrete mix designs for review. The mix designs shall include, as a minimum the following information:

- Concrete strength;
- Exposure class;
- Water-cement ratio;
- Maximum aggregate size;
- Maximum SCM replacement;
- Additional durability and architectural requirements;
- Slump range;
- Plastic air range;
- Method of placement;
- Dosage of corrosion inhibitor;
- Other specific information regarding the source and type of all materials being proposed;
- Source of Supplementary Cementing Materials (SCM's);
- Assumed minimum discharge and placing rates;
- Class of HVSCM (1 or 2).

1.10.5.2 Describe in detail on the mix design summary, the location(s) where each mix is to be placed in the structure. Provide a 3D digital model (or 3D pdf) indicating the location(s) where each mix is to be placed in the structure. Coordinate model with proposed construction joint locations.

1.10.6 Concrete Quality Plan

1.10.6.1 At least four weeks prior to the supply of concrete to the project, submit a complete “Concrete Quality Plan”, in the format provided by ARMCA.

1.10.7 Trial Batches

1.10.7.1 Submit detailed documentation regarding the trial batch testing and monitoring program.

1.10.8 Sloped Concrete Slabs

1.10.8.1 Well in advance of construction, submit complete details of placing and compaction procedures for sloping roofs, including details of construction and placing of top forms and top form panel.

1.10.9 Wet Curing Procedures
1.10.9.1 At least four weeks prior to implementation in the field, submit a detailed description of the procedures which will be employed to cure the structure.

1.10.9.2 As a minimum, the procedures shall indicate:

1.10.9.2.1 the method for protecting the concrete from evaporation of surface moisture from the fresh concrete;

1.10.9.2.2 the type of curing method to be used;

1.10.9.2.3 details of how various surfaces will be cured (slabs, walls, columns, ramps etc.)

1.10.9.2.4 how the surface will be kept moist, and the quality control requirements for keeping the surface moist;

1.10.9.2.5 the time of initiation and duration of curing;

1.10.9.2.6 provisions to address potential problems such as high winds and hot and cold weather;

1.10.9.2.7 the limitations of access, if any, to the surfaces being cured; and

1.10.9.2.8 a QA/QC program detailing how the curing program will be implemented, monitored and documented.

1.10.9.3 Submit a 300mm x 300mm (12" x 12") sample of each type of material (absorptive mat, fabric, plastic film, waterproof paper etc.) which will be used to wet cure the concrete.

1.10.10 HVSCM Concrete

1.10.10.1 For concrete with HVSCM such as fly-ash, slag and silica fume, submit documentation providing the actual reduction of Portland cement from the base mix to the actual HVSCM mix for all concrete – see below for further information. The information should be submitted in a letter signed by the concrete supplier/manufacturer or professional engineer acting on their behalf.

1.10.10.1.1 The reduction in Portland cement from Base Mix to Actual SCM Mix (as a percentage of Base Mix), where Base Mix is defined below. This can be submitted as a total reduction of Portland cement for all the concrete mixes used on the project.

1.10.10.1.2 Portland cement content of Base Mix (kg/m3) = Design strength values in MPa at 28 days x K

where K = 10 for non-air-entrained concrete, or K = 12.5 for air-entrained concrete.

1.10.10.1.3 Portland cement reduction = (Portland cement content of Base Mix – Portland cement content of Actual SCM Mix) / Portland cement content of Base Mix.
1.10.10.2 Submit documentation of where the concrete constituents were extracted, processed and manufactured. State method of transportation (rail, water or road).

2 Products

2.1 MATERIALS

2.1.1 Concrete: Normal density concrete with an air dry density between 2350 and 2450 kg/m³. Conform to CSA A23.1.

2.1.2 Cement Type: GU General Use Portland Cement.

2.1.3 Supplementary Cementing Materials: Conform to CSA A3001.

2.1.4 Water: Clean, potable and not detrimental to concrete.

2.1.5 Nominal Size of Coarse Aggregate: 20 mm, except as noted below.

2.1.5.1 Use pea gravel (5 mm to 10 mm) where concentration of reinforcement requires the use of a smaller diameter aggregate.

2.1.5.2 Use 10 mm (maximum) aggregate in toppings that are less than or equal to 75 mm in thickness, and 20 mm aggregate in toppings greater than 75 mm in thickness.

2.1.6 Curing Compound: Conform to CSA A23.1.

2.1.7 Grout Beneath Base Plates: Non-shrink flowable grout in-Pakt by King Construction Products, or approved alternative, having a compressive strength at 28 days of at least 60 MPa. Where grout is exposed to view or weather, use non-ferrous grout.

2.1.8 High Strength Concrete

2.1.8.1 Cement Type: General Use Portland Cement (Type GU) or Low Heat of Hydration Portland Cement (Type LH) meeting the requirements of Standard CSA A3001A.

2.1.8.2 Supplementary Cementing Materials (SCMs)

2.1.8.2.1 It is anticipated that one or more supplementary cementing materials will have to be used in the concrete to produce a mix with acceptable fresh and hardened concrete properties and acceptable thermal characteristics during hardening. The materials will be one or more of the following:

   a) Granulated blast furnace slag,

   b) Metakaolin,

   c) Silica fume (for non-architecturally exposed concrete)

2.1.8.2.2 Supplementary cementing materials fly-ash, granulated blast furnace slab or silica fume, shall comply with the requirements of Standard CSA A3000 Cementitious Materials Compendium.

2.1.8.2.3 The supplier shall submit evidence satisfactory to the Owner to demonstrate that the storage and dispensing facilities for
supplementary cementing materials do not have any deleterious effects on the materials themselves. These facilities will not expose these materials to such effects as the agglomeration or balling of particles or any separation or change in effective particle size of solids in slurries or to freezing and thawing or to excessive heat.

2.1.8.3 Aggregates

2.1.8.3.1 The concrete supplier shall demonstrate, by appropriate tests that the aggregates chosen have the potential to meet the design strength and Modulus of Elasticity requirements specified herein.

2.1.8.3.2 Coarse Aggregate: Crushed rock conforming in all respects to Standard CSA A23.1. The maximum size of the coarse aggregates shall be 20 mm but smaller maximum sizes may be used.

2.1.8.3.3 Fine Aggregate: Natural and conforming to CSA A23.1.

2.1.9 Unshrinkable Fill

2.1.9.1 Cement type-General Use GU Portland

2.1.9.2 Minimum 24 hour strength - 0.07 MPa (10 psi)

2.1.9.3 Maximum 28 day strength - 0.4 MPa (60 psi)

2.1.9.4 Class of exposure - N/A

2.1.9.5 Size of coarse aggregate - 20 mm to 40 mm (3/4” to 1 ½”)

2.1.9.6 Slump at point of discharge - 150 mm to 200 mm (6” to 8”)

2.1.9.7 Calcium chloride or pozzolanic mineral admixtures shall not be used. Air entraining admixtures may be added if desired by the Trade Contractor.

2.1.10 Sealant for Exposed Separation Strips, Construction Joints, and Temporary Opening Joints: Multi-Component Polyurethane ‘Sikaflex 2C-SL’ by Sika, or approved alternate.

2.1.11 HVSCM Concrete

2.1.11.1 Cement Type: General Use Portland Cement (Type GU).

2.1.11.2 Compressive Strength: Achieved at 91 days.

2.1.11.3 Supplementary Cementing Materials (SCMs)

2.1.11.4 Supplementary cementing materials fly-ash, granulated blast furnace slab or silica fume, shall comply with the requirements of Standard CSA A23.1 and CSA A3001.

3 Execution

3.1 GENERAL

3.1.1 Ensure minimum concrete discharge and placing rates are maintained to avoid unexpected cold joints from forming in the structure.
3.2  PRE POUR MEETING

3.2.1  Prior to the initial supply of concrete to the project, the Construction Manager must schedule a “pre-pour meeting” as outlined in the concrete supplier’s concrete quality plan.

3.3  CONSTRUCTION JOINTS

3.3.1  Obtain approval from the Prime Consultant and Structural Consultant for location and details of construction joints not shown on structural drawings.

3.3.2  Provided proper placing, curing and protection means and methods are employed by the Trade Contractor, the maximum length/height of concrete pours shall be as follows:

3.3.2.1  The maximum length of a suspended concrete slab pour shall be 40 m (120'-0).

3.3.2.2  The maximum length of a concrete slab on steel deck pour shall be 30 m (100'-0).

3.3.2.3  The maximum length of the structured slab at grade shall be 30 m (100'-0).

3.3.2.4  The maximum length of a concrete foundation wall pour shall be 15 m (50').

3.3.2.5  The maximum height of a concrete pour shall be 5.2 m (17'-0). An exception will be made for architecturally exposed concrete columns subject to review of means and methods by concrete supplier, formwork trade, and concrete placer trade.

3.3.3  If the construction joints (including joints around temporary openings) will be exposed in its permanent condition, the joints must be caulked as outlined under the Materials section.

3.4  STRUCTURAL SLAB AT GRADE

3.4.1  General

3.4.1.1  Do not place concrete slabs at grade until the specified sub-floor material has been placed, inspected and approved.

3.4.1.2  Do not place concrete on a frozen sub-grade, or on one that contains frozen materials.

3.5  UNSHRINKABLE FILL

3.5.1  Unshrinkable fill is intended for use locally in place of granular backfill below slabs-on-grade or within excavations where compaction of granular material is difficult to achieve, specifically between the slabs-on-grade within the concrete cores and the structured slab at grade at the base of the cores. Obtain written approval from the Consultant prior to using unshrinkable fill.

3.5.2  The unshrinkable fill material shall flow into the excavation so that it fills the entire space. Care shall be taken to ensure that no air is entrapped beneath horizontal projections or in other locations within the excavation.

3.5.3  Where bracing, shoring and/or sheeting is used to support the sides of the excavation or to prevent movements that could damage other services or adjacent pavements, this support system shall be removed as backfilling proceeds.
3.6 SLOPING SLABS

3.6.1 In the case of sloping slabs, employ suitable concrete placing and compaction procedures to ensure that completed concrete has the specified design characteristics, and in particular, to prevent movement of plastic concrete resulting in cracking, loss of bond, etc. and to achieve a surface equivalent to a fine wood float finish suitable to receive the roofing membrane.

3.7 PLACING CONCRETE

3.7.1 Place all concrete in accordance with CSA A23.1, the concrete supplier’s requirements and as specified herein.

3.7.2 Immediately before placing concrete, clean forms and reinforcement of foreign matter.

3.7.3 Discharge concrete into forms in accordance with the time frames specified in CSA A23.1.

3.7.4 Place concrete on steel deck floors in a manner that avoids piling up of concrete. Do not drop concrete directly from buckets, but employ suitable means of distribution. Wet down deck during hot weather prior to concreting.

3.7.5 Remove concrete spilled onto forms around hoisting equipment before depositing concrete in these areas.

3.7.6 Pumping Concrete

3.7.6.1 Pumping or pneumatic placing of concrete shall only be used if the velocity of discharge is reduced to a point where no separation or scattering of the concrete occurs, and the consistency of the mix has been designed to allow such a system with no adverse effects on the quality of concrete.

3.7.6.2 Excess grout or mortar used to lubricate pipelines, or washout water, must not be discharged into the forms.

3.8 CURING CONCRETE

3.8.1 Cure all concrete in accordance with CSA A23.1, the concrete supplier’s requirements and as specified herein.

3.8.2 Wet Curing

3.8.2.1 The following provisions apply to the structured slab at grade and topping slabs.

3.8.2.2 Basic Curing Period - the concrete shall be protected from premature drying and extremes of temperatures, and shall be wet cured at a temperature of at least 10°C for a period of three (3) consecutive days. Wet curing shall commence immediately after placement and finishing of the concrete.

3.8.2.3 Additional Curing for Durability - Immediately following the Basic Curing Period, continue to wet cure the concrete (at a minimum temperature of 10°C for an additional four (4) consecutive days or until the concrete reaches 70% of its 28 day compressive strength, whichever is greater.

3.8.2.4 Wet curing is to be achieved using one or more of the techniques outlined in CSA A23.1.
3.8.2.5 If an absorptive mat or fabric material is used, it is imperative that it be kept continuously wet, by means of sprinklers, soaker hoses, a layer of polyethylene sheeting above, or another acceptable means.

3.8.2.6 The use of curing compounds will not be permitted in these areas.

3.9 PROTECTION

3.9.1 Protect all concrete in accordance with CSA A23.1, the concrete supplier’s requirements and as specified herein; to prevent freshly deposited concrete from adverse conditions such as high winds, precipitation, freezing, being exposed to abnormally high temperatures or temperature differentials, premature drying, and moisture loss, for a period of time necessary to develop the specified properties of the concrete.

3.9.2 Cold Weather Concreting

3.9.2.1 Between the 15th of September of any year and the 15th of May of the following year, or when the temperature is at or below 5°C (41°F) or anticipated to fall below 5°C (41°F) within 24 hours of placing concrete, provide on hand and ready for use all equipment necessary for adequate cold weather protection and curing before concrete placement is begun.

3.9.2.2 When fresh concrete is to be cast against existing concrete, prevent the loss of heat by extending the protection for the fresh concrete over the existing.

3.9.2.3 Insulate, or enclose within the protective housing, tie rods, reinforcement or metal which projects from the concrete being protected.

3.9.2.4 Construct enclosures tight and safe for wind and snow loadings.

3.9.2.5 Maintain housing, enclosures and supplementary heat in place for entire period of protection, except that sections may be temporarily removed as required to permit placing additional forms or concrete provided the uncovered concrete is not permitted to freeze. Make up time lost from the required period of protection at the required temperature before protection is discontinued and removed. Protection is not to be completely removed until the concrete has cooled to within the temperature differential limits specified in CSA A23.1.

3.9.2.6 Locate heating units to avoid heating concrete locally or drying it excessively. Avoid high temperature and dry heating within enclosures.

3.9.2.7 Take particular care to maintain edges and corners of concrete at the required temperature owing to their greater vulnerability to freezing.

3.9.2.8 Provide sufficient insulation, and heat as necessary, to prevent freezing of frost susceptible soil which lies against structural elements; in particular protect soil beneath footings and behind foundation walls until the building is completed.

3.9.3 Hot Weather Concreting

3.9.3.1 When the rate of moisture evaporation exceeds 0.5kg/m² per hour or when the temperature is greater than or equal to 27°C (81°F), employ the following measures in addition to the requirements of CSA A23.1:

3.9.3.1.1 Use ice as mixing water, or an alternate temperature reducing or set retarding admixture, (subject to review by the Consultant), to lower the concrete temperature.
3.9.3.1.2 Dispatch ready-mix trucks and organize work to keep mixing time to a minimum. Minimize exposure of mixing trucks to the hot sun while waiting. Water should be made available to spray the exterior of the drum while the truck is waiting to discharge its concrete.

3.9.3.1.3 Provide adequate personnel and organize work to keep placing time to a minimum.

3.9.3.1.4 Place concrete in layers thin enough and areas small enough so that the time interval for placing is reduced and compaction will ensure complete union of adjacent portions.

3.9.3.1.5 With formed concrete, reliance shall not be placed on the forms alone to provide curing. Spray formwork with water to keep it tight and free from cracking.

3.9.4 Protection of Completed Work

3.9.4.1 At all times during the work, protect exposed concrete, exposed masonry and other exposed members from staining or becoming coated with concrete leakage due to continuing concreting operations. Members which become coated may be classed as defective by the Prime Consultant.

3.9.4.2 Protect exposed members from staining due to rusting of reinforcement projecting beyond construction joints.

3.9.4.3 Take suitable measures to prevent spalling and cracking damage occurring to the structure due to water freezing in expansion joints, small holes, slots, depressions and take suitable measures to prevent damage occurring to foundations and the like due to frost action in the soil or backfill.

3.9.4.4 The application of deicing salts on completed work is not permitted.

3.10 TOPPINGS

3.10.1 General

3.10.1.1 Conform to CSA A23.1 and the requirements noted below, unless noted otherwise in the contract documents.

3.10.1.2 Set screeds and bulkheads rigidly and accurately to prevent displacement during concreting.

3.10.1.3 Special provisions for bonded and unbonded toppings:

3.10.1.3.1 The maximum pour size for bonded and unbonded toppings is to be limited to 100 m² (1000 ft²).

3.10.1.3.2 Maintain a one to one length to width aspect ratio for all pours, where extent and geometry of topping permits.

3.10.1.3.3 Toppings are to be poured in a “checker board” pattern to minimize the effects of shrinkage. Adjacent sections of topping shall be poured no sooner than 3 days after the adjoining section was poured.

3.10.1.3.4 Ensure temperature of base course is 10°C (50°F) minimum prior to pouring toppings.
3.10.1.3.5 Provide hot and cold weather protection for toppings in accordance with CSA A23.1.

3.10.2 Monolithic Toppings

3.10.2.1 Monolithic toppings are constructed by applying a concrete mixture to a “freshly” poured base course that has lost all slump and bleed water, prior to its final set. Alternatively, monolithic toppings can be poured with the main base course to a final thickness equal to the thickness of the base course plus the thickness of the topping.

3.10.2.2 Where monolithic toppings are specified, place reinforcement and maintain cover requirements based on the thickness of the base slab only. Provide additional layer of reinforcement in monolithic toppings where noted on the contract documents.

3.10.3 Unbonded (Loose Laid) Toppings

3.10.3.1 Unbonded or loose laid toppings are constructed by applying the topping mixture over a bond breaker and hardened concrete base, to which no bonding agent has been applied. By definition, unbonded toppings are specifically designed so as not to bond to the concrete base.

3.10.3.2 Base Course Finishing and Preparation

3.10.3.2.1 Base courses which are to receive unbonded or loose laid toppings are to be finished smooth by means of a steel trowel.

3.10.3.3 Placing and Finishing Toppings

3.10.3.3.1 Place toppings on bond breaker and finish the toppings in accordance with CSA A23.1.

3.10.3.4 Curing

3.10.3.4.1 Continuously wet cure unbonded toppings for a minimum of seven days.

3.10.3.5 Jointing

3.10.3.5.1 Unbonded toppings are to be sawcut, as per the typical detail for slabs on grade, at a maximum spacing of 3.0 metres (10 feet) in both directions, unless noted otherwise. For toppings that are to receive hard architectural floor finishes, the jointing shall be laid out in accordance with the Architect’s requirements and is subject to final approval by the Architect.

3.10.4 Cracks in Toppings

3.10.4.1 All cracks in concrete toppings must be repaired by the Trade Contractor. Extent of repair and method of crack repair must meet the requirements of flooring installation Trade Contractor and the Owner.

3.11 OPENINGS THROUGH COMPLETED MEMBERS

3.11.1 Do not cut openings through completed members without the Structural Consultant's approval.
3.11.2 Where the location of openings is approved, locate the reinforcement by cover meter or other positive means as required by the Structural Consultant and adjust the location of the opening so that no reinforcement is cut unless specifically approved otherwise in writing by the Structural Consultant.

3.12 MAKING GOOD

3.12.1 Where directed by the Consultant, makegood temporary openings left in concrete construction around pipes, ducts and the like using a mortar of the same proportions as the surrounding work. Reinforce mortar with welded wire fabric where openings exceed 75 mm (3"). Roughen existing surfaces to receive mortar or apply suitable bonding agent such that mortar will be securely bonded to existing concrete.

3.13 GROUTING BENEATH BASE PLATES

3.13.1 Grout beneath plates bearing on concrete with an approved non-shrink flowable grout. Conform with the manufacturer's directions for mixing and placing grout. Completely fill voids below plates. Fill voids left by shims after shims are removed.

3.13.2 During cold weather, preheat base plates and footings and maintain temperature at minimum 12°C (54°F) for 6 days after grouting.

3.13.3 Refer to Section 05 12 00 for lifting of base plates to determine adequacy of grouting. If defects are found, more base plates will be raised.

3.14 HIGH STRENGTH CONCRETE

3.14.1 Cooling of Concrete

3.14.1.1 In summer months the cooling of high strength concrete is required to control the generation of heat in the concrete and to meet the requirements of this specification.

3.14.2 Formwork

3.14.2.1 Removal of Forms - Remove forms for columns and vertical elements as soon as practical (approximately 24 hours depending upon admixtures used, ambient temperature, etc.) to minimize rate of heat build-up. Provide protection to concrete when necessary to prevent thermal shock.

3.14.3 Depositing

3.14.3.1 Mixing time is very critical in the use of high strength concrete. Unless demonstrated by appropriate tests and test results, do not use concrete mixed more than ¾ hour during hot weather conditions nor 1½ hours at other times.

3.14.3.2 Maximum temperature of concrete prior to placing is 18°C (65°F).

3.14.4 Consolidation

3.14.4.1 Thoroughly compact high strength concrete during depositing by the use of internal mechanical vibrators.

3.14.5 Curing

3.14.5.1 Cure all high strength concrete in accordance with CSA A23.1.
3.14.5.2 During hot weather, provide continuous water curing, for a period of approximately 48 hours or such time as is required until the temperature of concrete begins to fall. In this case, water curing is used to prevent excessive rise in temperature.

3.15 TREATMENT OF FORMED SURFACES NOT DESIGNATED AS ARCHITECTURALLY EXPOSED CONCRETE

3.15.1 Do work in accordance with CSA A23.1 and as follows:

3.15.1.1 Provide smooth form finish to concrete surfaces exposed to public view and surfaces to receive plaster and the like.

3.15.1.2 Remove traces of form lining compound from concrete surfaces which may affect the bonding of following surface application.

3.16 QUALITY CONTROL

3.16.1 Implement a system of quality control to ensure that the minimum standards specified herein are attained.

3.16.2 Adhere to the requirements of the project “Concrete Quality Plan” prepared and submitted as required under the Submittals section of this specification.

3.16.3 Bring to the attention of the Consultant any defects in the work or departures from the Contract Documents which may occur during Construction. The Consultant will decide upon corrective action and give his recommendations in writing.

3.16.4 The Consultant’s general review during construction and inspection and testing by independent inspection and testing agencies reporting to the Consultant are both undertaken to inform the Owner of the Construction Manager’s performance and shall in no way augment the Construction Manager’s quality control or relieve the Construction Manager of contractual responsibility.

3.17 NOTIFICATION

3.17.1 Prior to commencing significant segments of the work, give the Consultant and independent inspection and testing agencies appropriate notification so as to afford them reasonable opportunity to review the work. Failure to meet this requirement may be cause for the Consultant to classify the work as defective.

3.18 INSPECTION AND TESTING

3.18.1 Appointment of Independent Inspection and Testing Companies

3.18.1.1 The Owner will appoint the Independent Inspection and Testing Companies to make inspections or perform tests as the Consultant directs. The Independent Inspection and Testing Companies shall be responsible only to the Consultant, and shall make only such inspections or tests as the Consultant may direct.

3.18.1.2 When defects are revealed, the Owner may request, at the Trade Contractor’s expense, additional inspection or testing to ascertain the full extent of the defect.

3.18.2 Concrete Quality Tests

3.18.2.1 Concrete quality tests shall be carried out in accordance with CSA A23.1 and shall include the following:
3.18.2.1.1 Slump
3.18.2.1.2 Air content of fresh concrete
3.18.2.1.3 Temperature of fresh concrete
3.18.2.1.4 Compressive strength
3.18.2.1.5 Density (for low-density and semi-low-density concrete only)

3.18.2.2 Compressive Strength Tests: Compressive cylinder testing will be carried out in accordance with CSA A23.1 and as follows: Three companion laboratory cured concrete standard compression test cylinders; one tested at 7 days and two tested at 28 days, constitute a strength test. During the placing of concrete in cold weather one additional field cured test cylinder will be made and tested at 7 days. The results of the 7 day tests related to curing procedure shall be the basis to strip soffit forms from horizontal or inclined members.

3.18.2.3 High Strength Concrete and HVSCM: Compressive cylinder testing will be carried out in accordance with CSA A23.1 and as follows: Four companion laboratory cured concrete standard compression test cylinders; one tested at 7 days, one tested at 28 days and two tested at 56 or 91 days, whichever is the specified test age. In addition, two accelerated test cylinders shall be made and tested in accordance with Standard CSA A23.2.

3.18.2.4 Core Samples for Chloride Ion Permeability Test

3.18.2.4.1 C-1, A-1 and C-XL concrete exposure classes: Chloride ion permeability test shall be carried out in accordance to CSA A23.1 and ASTM C1202 and as follows: Each test shall consist of 4 companion in-situ core specimens at locations determined by the Engineer. Test one core specimen at 7 days, one at 28 days and two at 56 days.

3.18.2.4.2 Spec. Note: Designer to be aware of impact of these cores and allow for it in the design.

3.18.2.4.3 Where cores are taken for chloride ion permeability tests, the core areas are to be filled and reinstated with King Self-Leveling Concrete or approved equivalent reviewed by the Engineer. The Independent Testing and Inspection agency will perform four concrete cores for each pour consisting of concrete exposure class C-1, A-1 or C-XL.

3.18.2.5 Cylinders for Chloride Ion Permeability Test

3.18.2.5.1 C-1, A-1 and C-XL concrete exposure classes: Rapid chloride permeability test shall be carried out in accordance to CSA A23.1 and ASTM C1202 and as follows: Each test shall consist of 3 cylinder specimens. Concrete specimens are to be field cured in conditions similar to the in-situ concrete. Test one cylinder specimen at 7 days, one at 28 days and two at 56 days.

3.18.3 Grout Under Baseplates: At least one strength test may be made each day that grout is placed under baseplates.

3.18.4 Inspection of Soil
3.18.4.1 Soil at structured slab at grade elevations will be inspected.

3.19 DEFECTIVE MATERIALS AND WORK

3.19.1 Where evidence exists that defective work has occurred or that work has been carried out incorporating defective materials, the Consultant may have tests, concrete coring, inspections or surveys performed, analytical calculations of structural strength made and the like in order to help determine whether the work must be repaired or replaced. Tests, inspections or surveys or calculations carried out under these circumstances will be made at the Trade Contractor's expense, regardless of their results, which may be such that, in the Consultant's opinion, the work may be acceptable.

3.19.2 All testing shall be conducted in accordance with the requirements of the Alberta Building Code, except where this would in the Consultant's opinion cause undue delay or give results not representative of the rejected material in place. In this case, the tests shall be conducted in accordance with the standards given by the Consultant.

3.19.3 Materials or work which fail to meet specified requirements may be rejected by the Consultant whenever found at any time prior to final acceptance of the work regardless of previous inspection. If rejected, defective materials or work shall be promptly removed and replaced or repaired to the satisfaction of the Consultant, at no expense to the Owner.

END OF SECTION
1 General

1.1 SUMMARY

1.1.1 This Section specifies Architecturally Exposed Concrete (AEC), including formwork, reinforcement accessories, concrete materials, concrete mix design, placement procedures, and finishes.

1.1.2 Provision of custom fabricated elastomeric form liners for texturing architecturally exposed concrete and form liner accessories including, but not limited to, fasteners, sealants, rustication and backup strips, form release agents, and sealers.

1.1.3 Read this section in conjunction with Section 03 30 00 – Cast-In-Place Concrete; successful completion of work of this section requires high levels of experience and positive cooperation of all parties involved with concrete placement including, but not limited to, the Consultant, structural design engineer, formwork specialist, formwork assembly crews, concrete supplier and Construction Manager.

1.1.4 Concrete – General:

1.1.4.1 All exposed concrete (except in back-of-house areas and stairwells) classified as Architecturally Exposed Concrete. Concrete should be uniform and white in colour, and substantially free from bug holes, honeycombing, and other imperfections. Mixes may contain slag, metakaolin, or other cement replacers or additives to achieve target colour. All AEC concrete strengths and types are subject of visual approval by Consultant through samples representative of mix and finish.

1.1.5 Corners:

1.1.5.1 All exposed concrete corners to have sharp edges (no chamfers). Applies to vertical and horizontal corners (columns, beams etc). Corners to be lightly sanded after form stripping. All AEC vertical corners and edges to receive plywood protection to 2 440 mm in height as soon as formwork is stripped to prevent damage during construction Process.

1.1.6 Limit Or Eliminate Staining Of Formwork By Rebar Throughout:

1.1.6.1 Use new rebar throughout, NO rust.

1.1.6.2 Any rebar stored on-site or in supplier’s yard shall be sheltered to prevent formation of rust during storage.

1.1.6.3 Particularly in columns, any exposed rebar should be tarp covered between concrete placements to prevent staining of AEC by rust.

1.1.7 Formwork, Vertical Elements:

1.1.7.1 Phenolic resin coated, 1 220 mm x 2 440 mm x 19 mm thick formwork. Fully sealed joints to prevent bleeding and leakage. Tie-holes in columns will not be accepted; design formwork to avoid tie-holes.

1.1.8 Formwork, Horizontal Elements:

1.1.8.1 Smooth plywood formwork for beams, purlins, and slabs, free of cracks and knots greater than 13 mm. Tie holes in beams, girders, and purlins will not be accepted; design formwork to avoid tie-holes.

1.1.8.2 Submit shop drawings for formwork joint patterns for AEC elements (including columns, beams, and soffits) for review by Consultant.
1.1.9 Finishing:
   1.1.9.1 No patching or finishing work is to proceed without Consultants approval.
   1.1.9.2 AEC concrete is to be cleaned after patching, with palm sander or otherwise, depending on level of cleaning required to achieve uniform light colour finish.

1.1.10 Bidders to submit verification samples concrete mixes with their Bid Submission.

1.2 RELATED REQUIREMENTS
1.2.1 Section 01 35 31 - LEED Special Project Procedures
1.2.2 Section 03 10 00 Concrete Formwork and Falsework: General cast-in-place concrete formwork materials and methods relating to non-architecturally exposed concrete.
1.2.3 Section 03 20 00 – Concrete Reinforcing: Common concrete reinforcing materials relating to concrete for the project.
1.2.4 Section 03 30 00 – Cast-In-Place Concrete: Structural and general cast-in-place concrete construction, including formed and unformed finishes for non-architecturally exposed concrete finishes.
1.2.5 Section 03 35 00 – Concrete Finishing: Schedule of concrete finish abbreviations.
1.2.6 Section 03 45 00 - Precast Architectural Concrete: Similar finish
1.2.7 Section 07 92 00 – Joint Sealants: Elastomeric joint sealants in contraction and other joints in architecturally exposed concrete.
1.2.8 Section 09 96 23 - Graffiti Resistant Coatings: Application of graffiti resistant coatings to new architecturally exposed concrete.

1.3 DEFINITIONS
1.3.1 Architecturally Exposed Concrete (AEC): Concrete that is exposed to view on surfaces of the completed structure or building and that requires special concrete materials, formwork, placement, or finishes to obtain specified architectural appearance, using personnel experienced in the work required by this Section.
1.3.2 Design Reference Picture: Picture designated by Consultant in the Contract Documents that indicates acceptable surface quality and appearance of architecturally exposed concrete.

1.4 REFERENCE STANDARDS
1.4.1 American Concrete Institute (ACI):
   1.4.1.1 ACI 117-10, Specification for Concrete Construction and Materials, and as modified in this Section
   1.4.1.2 ACI 301-10, Specifications for Structural Concrete
   1.4.1.3 ACI 303.1-97, Standard Specification for Cast-in-Place Architectural Concrete
   1.4.1.4 ACI 303R-04, Guide to Cast-in-Place Architectural Concrete
   1.4.1.5 ACI 347-04, Guide to Formwork for Concrete
1.4.2 American Society for Testing and Materials (ASTM):
   1.4.2.1 ASTM C94/C94M-13a, Standard Specification for Ready-Mixed Concrete
   1.4.2.2 ASTM C150/C150M-12, Standard Specification for Portland Cement
   1.4.2.3 ASTM C311/C311M-13, Standard Test Methods for Sampling and Testing Fly Ash or Natural Pozzolans for Use in Portland-Cement Concrete
1.4.2.4 ASTM C595/C595M-13, Standard Specification for Blended Hydraulic Cements
1.4.2.5 ASTM C920-11, Standard Specification for Elastomeric Joint Sealants
1.4.2.6 ASTM C979/C979M-10, Standard Specification for Pigments for Integrally Colored Concrete
1.4.2.7 ASTM C1059/C1059M-99(2008), Standard Specification for Latex Agents for Bonding Fresh To Hardened Concrete

1.4.3 Canadian Standards Association (CSA):
1.4.3.1 CSA A3000-08, Cementitious Materials Compendium
1.4.3.2 CSA S269.1 1975(R2003), Falsework for Construction Purposes

1.4.4 Refer to Section 03 30 00 for applicable reference standards; materials, procedures, and requirements specified in Section 03 30 00 apply to AEC specified in this Section, except as specifically modified to meet required tolerances, textures and finishes.

1.5 ADMINISTRATIVE REQUIREMENTS

1.5.1 Pre-Construction Meeting: Conduct pre-construction meeting at Project site to comply with requirements in Section 01 31 19 – Project Meetings; meeting will address following items require representatives of each entity directly concerned with AEC to attend including but not limited to, the following:

1.5.1.1 Construction Manager,
1.5.1.2 Trade Contractor,
1.5.1.3 Concrete formwork manufacturer,
1.5.1.4 Concrete formwork installer,
1.5.1.5 Ready-mix concrete manufacturer,
1.5.1.6 Testing agency, and
1.5.1.7 Consultant.

1.5.2 Agenda for pre-construction meeting will include; but not be limited to, the following topics:

1.5.2.1 Consultant’s design criteria and expected results.
1.5.2.2 Concrete formwork and ready-mix concrete manufacturers proposed materials to produce required concrete textures and finishes.
1.5.2.3 Concrete mixes and admixtures required to achieve concrete finishes, specifically addition of super plasticizers to concrete mix to achieve sufficient flow required to reduce honeycombing, admixtures or cementitious materials affecting colour, bug holes and other reductions in surface quality and appearance.
1.5.2.4 Cold and hot weather concreting procedures.
1.5.2.5 Curing procedures.
1.5.2.6 Placement of construction joints.
1.5.2.7 Types of forms and form removal limitations.
1.5.2.8 Reinforcement accessory installation.
1.5.2.9 Concrete repair procedures.
1.5.2.10 Acceptable tolerances for out-of-plumb, flat or level, and placement of formwork.
1.5.2.11 Protection of AEC from work of following trades through a formalized education process.
1.5.2.12 Meeting will also discuss and propose solutions for architectural formwork and range of expected architectural finishes, cold and hot weather concreting procedures, curing procedures, elimination of construction joints, forms and form removal limitations, reinforcement and accessory installation, concrete repair procedures, methods for creating 90° edge profiles, and protection of AEC.
1.5.3 Coordination: Coordinate with subsequent components of the Work and inform all personnel that use of permanent or staining markers such as felt tip markers, wax crayons, lead pencils and similar writing instruments will not be permitted on finished AEC surfaces.

1.6 SUBMITTALS

1.6.1 Make submittals in accordance with Section 01 33 00 – Submittal Procedures.

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

1.6.2.1 Product Data: Submit product data for each type of manufactured material and product indicated.

1.6.2.2 Shop Drawings: Submit shop drawings of formwork indicating formwork form facing joints, rustications, construction and contraction joints, form joint sealant details, form tie location and patterns, inserts and embedment, cut outs, cleanout panels, and other items that visually affect AEC.

1.6.2.3 Samples: Submit samples for each of the following materials:

1.6.2.3.1 Form Facing Panel: 300 mm x 300 mm of each different form facing material.

1.6.2.3.2 Form Ties: 1 of each different type.

1.6.2.3.3 90° edge profiles

1.6.2.3.4 Sample Panel: Submit AEC samples for verification with Bid Submission, one (1) sample of each AEC mix to be used in project, including admixtures, cast vertically, approximately 450 mm x 450 mm x 50 mm thick, of finishes, colours, and textures to match the design reference sample.

1.6.2.4 Quality Control Plan: Submit quality control plan to ensure consistency in AEC. Include special measures required for concrete additives (i.e. Metakaolin, flyash, blast-furnace slag, etc.) that would affect the structural and visual performance of the AEC.

1.6.3 Informational Submittals: Provide the following submittals when requested by the Consultant:

1.6.3.1 Design Mix: Submit design mixes for each concrete mix, including alternate mix designs when characteristics of materials, project conditions, weather, test results, or other circumstances warrant adjustments.

1.6.3.2 Certificates: Submit material test reports from a qualified testing agency indicating and interpreting test results of the following for compliance with requirements indicated, based on comprehensive testing of current materials:

1.6.3.2.1 Cementitious materials and aggregates.

1.6.3.2.2 Admixtures.

1.6.3.2.3 Curing compounds.

1.6.3.2.4 Repair materials.

1.6.3.3 Concrete Placement Schedule: Submit concrete placement schedule before starting AEC placement operations including, but not limited to, location of form joints, construction joints and expansion joints.

1.6.3.4 Minutes of Site Meetings: Submit minutes of prefabrication and pre-installation conference.

1.6.4 Sustainable Design Submittals: Coordinate project sustainable design requirements with Section 01 35 31 - LEED Special Project Procedures and Section 01 35 31A - LEED Material Information Sheet for LEED Submittals.
1.7 QUALITY ASSURANCE

1.7.1 Refer to Section 03 31 00 for quality assurance requirements; use only personnel having experience in setting formwork and providing finished AEC; provide proof of experience when requested by Consultant.

1.7.2 Consultant’s Design Reference:

1.7.2.1 The following image portrays the design intent, but does not indicate the actual surface profile or patterning.

1.7.2.2 Architectural cast-in-place concrete will use prefabricated forms to provide a surface texture based; with finished concrete placed in a single application using forming materials and placement methods that reduce the probability of paste bleed-out, air inclusions and other form imperfections.

1.7.2.3 Form concrete edges, profile of rustications and reveals with 90° profile; provide methods to correct chamfers where required for formwork removal back to 90° profile.

1.7.2.4 Design reference sample available at Consultant’s office for review.

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1.7.2.5 Architecturally exposed concrete vertical surfaces are defined as follows:

Figure 1 – Concrete Finish, Smooth Column Form Liner: Smooth finish with no ring mark or seam marks, providing polished appearance free from, staining, laitance, bug holes larger than 3 mm with no honeycombing or patching. Plywood protection at base, and temporary tarps for exposed rebar.
Figure 2 – Concrete Finish, Smooth Form Finish Columns and Beams

Figure 3 – Concrete Finish, Smooth Formed Surfaces With 90° Corners
1.8 MOCK-UPS

1.8.1 Sample Panels: Build sample panels to demonstrate aesthetic effects in accordance with Section 01 45 00 – Quality Control for mock-ups and as follows:

1.8.1.1 Build sample panels for each type of AEC in sizes approximately 1220 mm long x 1220 mm high x 150 mm thickness samples for AEC slabs and 1200 mm x 300 mm x 300 mm thickness for AEC column mixes; include one corner return, reveals and features, and using contract materials, methods and workmanship:

1.8.1.1.1 Include concrete mix, forming system, form release agents, placement rate, joint sealing, vibrating and stripping practices.

1.8.1.1.2 Demonstrate patching and repair procedures for spawled concrete, and voids caused by honeycombing or bug holes.

1.8.1.2 Sample panels will be reviewed for:

1.8.1.2.1 Methods of curing, surface smoothness, and coatings, as applicable; retain samples of cements, sands, aggregates, and colour additives used in mock-up for comparison with materials used in remaining Work.

1.8.1.2.2 Damage part of an exposed face surface for each finish, colour, and texture, and demonstrate materials and techniques proposed for repair of tie holes and surface blemishes to match adjacent undamaged surfaces; Consultant will be present during damage and repair demonstration.

1.8.1.2.3 Colour, texture, and quality of concrete surfaces.
1.8.1.2.4 Relationship of formed reveals and rustications, continuity of formed features around corners.

1.8.1.2.5 Quality of formed joints and profiles, and treatment of chipped or broken edges.

1.8.1.2.6 Aesthetic qualities of workmanship.

1.8.1.2.7 Other material and construction qualities specifically accepted by Consultant in writing.

1.8.1.2.8 Obtain Consultant's acceptance of sample panels before casting AEC.

1.8.1.2.9 Maintain sample panels during construction in an undisturbed condition as a standard for judging the completed Work.

1.8.1.3 Damage part of an exposed face surface for each finish, colour, and texture, and demonstrate materials and techniques proposed for repair of tie holes and surface blemishes to match adjacent undamaged surfaces; Consultant will be present during damage and repair demonstration.

1.8.1.4 Erect sample panels adjacent and parallel to surfaces where AEC will form a part of the completed construction.

1.8.1.5 Store reviewed sample panels on site in a protected location until completion of the work of this Section for use as a comparison to installed materials.

1.8.1.6 Clean ½ of the exposed faces of sample panels with proprietary concrete cleaner to illustrate cleaning techniques and control of efflorescence.

1.8.2 Mock-ups: Construct mock-ups to verify selections made after review of sample panels to demonstrate aesthetic effects and set quality standards for materials and execution in accordance with Section 01 45 00 – Quality Control for mock-ups and as follows:

1.8.2.1 Build mock-up of typical AEC column, beam, and soffit as indicated on Drawings, using construction that will not be architecturally exposed in final construction and using contract materials, methods and workmanship:

1.8.2.1.1 Incorporate formwork accessories and minimum one vertical and one horizontal form liner joint and their intersection.

1.8.2.1.2 Include concrete mix, forming system, form release agents, placement rate, form pressures, joint sealing, vibrating and stripping practices.

1.8.2.1.3 Demonstrate patching and repair procedures for spawled concrete, and voids caused by honeycombing or bug holes.

1.8.2.1.4 Mock-up beams/soffits/columns in the back-of-house areas of Level 0, north of the multipurpose rooms, just west of the LRT, (between gridlines 7 and 8, and gridlines B and C).

1.8.2.2 Include mock-ups for each AEC finish indicating final construction and appearance.

1.8.2.3 Protect reviewed mock-ups from construction activities until completion of work of this Section.

1.8.2.4 Mock-ups will be reviewed for:

1.8.2.4.1 Colour, texture, and quality of concrete surfaces.

1.8.2.4.2 Relationship of formed reveals and rustications, continuity of formed features around corners.

1.8.2.4.3 Quality of formed joints and profiles, and treatment of chipped or broken edges.

1.8.2.4.4 Aesthetic qualities of workmanship.
1.8.2.5 Mock-ups found acceptable by the Consultant may become part of the completed Work if undisturbed at time of Substantial Performance.

1.8.3 Review and acceptance of sample panels and mock-ups does not constitute approval of deviations from the Contract Documents contained in sample panels and mock-ups unless Consultant specifically notes such deviations in writing.

1.8.4 Remove and replace sample panels and mock-ups considered as not acceptable by the Consultant; Work installed and determined as not acceptable will administered as a construction deficiency with payment for deficient work withheld until corrected in a manner directed by the Consultant.

2 Products

2.1 MANUFACTURERS

2.1.1 Basis-of-Design Materials: Products named in this Section were used as the basis-of-design for the project; manufacturers listed as additional acceptable materials 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.

2.1.2 Additional Acceptable Materials Manufacturers: Subject to matching of colour and compliance with performance requirements specified in this Section; as established by the Basis-of-Design Materials, use any of the listed manufacturers’ products in accordance with Section 01 62 00 – Product Options.

2.1.3 Substitutions: Consultant may consider additional manufacturers having similar products to Acceptable Materials Manufacturers listed above during the construction period, provided they meet the performance requirements established by the named products and provided they submit requests for substitution in accordance with Section 01 25 00 – Substitution.

2.2 FORMWORK MATERIALS

2.2.1 Square Column Formwork: Pre-manufactured formwork systems designed specifically to minimize imperfections in concrete finish and provide symmetrical and consistent joint and tie arrangements as indicated on Drawings for AEC, engineered to withstand high fresh concrete pressure, and as follows:

2.2.1.1 Basis-of-Design Materials: Finland Forms

2.2.2 Formwork System: Purpose made concrete formwork system consisting of permanent spacer tubes, sealing rings and cones to provide protection from percolating water, forming a part of the concrete formwork system for AEC as follows:

2.2.2.1 Basis-of-Design Materials: Finland Forms

2.2.3 Form Release Agent: Proprietary, non-volatile material that will not stain the concrete or impair the subsequent application of finishes or coatings to the surface of concrete, derived from agricultural sources, non-petroleum containing, low or no VOC material; eligible for contribution towards LEED Certification; formulate form release agent with rust inhibitor for steel form facing materials.

2.3 FORM FACING MATERIALS

2.3.1 Standard Form Facing Panels: Form facing material requirements specified in Section 03 10 00 and as follows:

2.3.1.1 Form-Facing Panels for Finishes: Steel, glass-fibre-reinforced plastic, or other non-absorptive panel materials acceptable to the Consultant that will provide continuous, true, and smooth AEC surfaces; provide in largest practicable sizes to minimize number of joints.
2.4 ACCESSORIES

2.4.1 Form Joint Tape: Compressible foam tape, pressure sensitive, AAMA 810.1, minimum 6 mm thick.

2.4.2 Form Joint Sealant: Elastomeric sealant complying with ASTM C920, Type M or S, Grade NS, that adheres to form joint substrates as specified in Section 07 92 00.

2.4.3 Surface Retarder: Chemical liquid set retarder, for application on form facing materials, capable of temporarily delaying final hardening of newly placed concrete surface to depth of reveal specified.

2.4.4 Form Ties (concealed non-visible areas only, i.e. back-of-house and stairwells): Factory fabricated glass fibre reinforced plastic designed to resist lateral pressure of fresh concrete on forms and to prevent spalling of concrete on removal:

2.4.4.1 Provide ties with tapered tie cone spreaders that, when removed, will leave holes not larger than 19 mm in diameter on concrete surfaces.

2.4.4.2 Provide glass fibre reinforced plastic ties, not less than 13 mm in diameter, of colour selected by Consultant from manufacturer's full range.

2.4.5 Anti-Graffiti Coating: Refer to Section 09 96 23 – Graffiti resistant coatings.

2.5 REINFORCEMENT

2.5.1 Steel Reinforcement and other requirements for reinforcement accessories in accordance with Section 03 20 00.

2.6 CONCRETE MATERIALS

2.6.1 Portland Cement: Normal type GU, grey colour, of same type, brand, and source for entire project with normal weight fine aggregates sized to fit profile of custom form liners, refer to Section 03 31 00 for additional concrete materials, aggregates, admixtures and curing materials.

2.6.2 Supplementary Cementitious Materials: Metakaolin, slag, flyash, or other replacements, meeting requirements of CSA A3001, being added to achieve light/near white coloration.

2.7 REPAIR MATERIALS

2.7.1 Bonding Agent: ASTM C1059/C1059M, Type II, non-re-dispersible, acrylic emulsion or styrene butadiene.

2.7.2 Epoxy Bonding Adhesive: ASTM C881/C881M, two component epoxy resin, capable of humid curing and bonding to damp surfaces, of class and grade to suit requirements, and as follows:

2.7.2.1 Types I and II, non-load bearing, for bonding hardened or freshly mixed concrete to hardened concrete.

2.8 CONCRETE MIXES

2.8.1 Prepare design mixes for each type and strength of AEC determined by either laboratory trial mix or site test databases.

2.8.2 Use a qualified independent testing agency for preparing and reporting proposed concrete mix designs for the laboratory trial mix basis.

2.8.3 Mix Design Engineering: Refer to Section 03 31 00 for mix design engineering requirements, provide mix design as follows:

2.8.3.1 Provide mix design suitable for AEC, providing minimal air pockets, bug holes and honeycombing.

2.8.3.2 Provide information relating to super plasticizers used to increase flow rate of low slump concrete mixes.
2.8.3.3 Provide appropriate aggregate size to suit formwork profile and surface finishing requirements.

2.8.3.4 All AEC to be light and near white in colour. Approved by samples and mock-ups.

3 Execution

3.1 FORM LINER PREPARATION

3.1.1 Verify lines and levels of formwork and form liner patterns are within allowable tolerances before placing concrete.

3.1.2 Clean liner before each use on multiple use liners.

3.1.3 Replace damaged liner where continued use or repair would negatively impact the aesthetics of the concrete finish.

3.1.4 Apply form liner compatible release agent at rate recommended by manufacturer.

3.1.5 Schedule concrete pour soon after application of release agent to avoid precipitation, dust, and debris.

3.1.6 Protect reinforcing steel from exposure to release agents.

3.2 FORMWORK

3.2.1 Coordinate formwork, embedded items, and shoring and re-shoring work with Section 03 10 00.

3.2.2 AEC Finish: Match Consultant's design reference sample, identified and described in item 1.7.2.1 above.

3.2.3 Related Unformed Surfaces: At tops of walls, horizontal offsets, and similar unformed surfaces adjacent to formed surfaces, strike off smooth and finish with a texture matching adjacent formed surfaces:

3.2.3.1 Continue final surface treatment of formed surfaces uniformly across adjacent unformed surfaces, unless otherwise indicated.

3.2.3.2 Maintain uniformity of special finishes over construction joints.

3.2.4 As Cast Formed Finishes:

3.2.4.1 Refer to conditions in item 1.1.

3.2.4.2 Rough Formed Finish: As cast concrete texture imparted by form facing material with tie holes and defective areas repaired and patched. Remove fins and other projections exceeding ACI 347 limits for class of surface specified.

3.2.4.3 Smooth Formed Finish: As cast concrete texture imparted by form facing material, arranged in an orderly and symmetrical manner with a minimum of seams:

3.2.4.3.1 Repair and patch tie holes and defective areas.

3.2.4.3.2 Remove fins and other projections exceeding 3 mm in height.

3.2.4.3.3 Do not apply rubbed finish to smooth formed finish.

3.2.5 Form Liner Finish:

3.2.5.1 Cast panel against form liners placed, secured, and sealed over formwork panels to produce a textured surface free of pockets, streaks, and honeycombs.

3.2.5.2 Produce a surface appearance of uniform colour and texture.

3.2.5.3 Fill tie holes with precast concrete plugs in accordance with manufacturer’s instructions.
3.3 TOLERANCES

3.3.1 Limit deflection of form facing panels to a minimum of 1/400th of its span; modify formwork whalers and panels to meet specified deflection limits, and limit surface irregularities defined by ACI 347 as abrupt or gradual as follows:

3.3.1.1 Class A: 3 mm within 3660 mm from standing surface.
3.3.1.2 Class B: 6 mm above 3660 mm.

3.3.2 Fabricate forms for easy removal without hammering or prying against concrete surfaces:

3.3.2.1 Provide crush or wrecking plates where stripping may damage cast in place surfaces.
3.3.2.2 Provide top forms for inclined surfaces steeper than 1.5 horizontal to 1 vertical.
3.3.2.3 Kerf rustications, keyways, reglets, recesses, and similar profiles for to aid removal and minimize damage to edges of concrete work.
3.3.2.4 Do not use rust stained steel form facing material.

3.3.3 Provide temporary openings for cleanouts and inspection ports where interior area of formwork is inaccessible:

3.3.3.1 Close openings with panels tightly fitted to forms and securely braced to prevent loss of concrete mortar.
3.3.3.2 Locate temporary openings in forms at inconspicuous locations.

3.3.4 Coat contact surfaces of wood rustications and chamfer strips with sealer before placing reinforcement, anchoring devices, and embedded items.

3.3.5 Form openings, chases, offsets, sinkages, keyways, reglets, blocking, screeds, and bulkheads required in the work, determine sizes and locations from trades providing such items.

3.3.6 Clean forms and adjacent surfaces to receive concrete; remove chips, wood, sawdust, dirt, and other debris just before placing concrete.

3.3.7 Retighten forms and bracing before placing concrete to prevent mortar leaks and maintain proper alignment.

3.4 REINFORCEMENT AND INSERTS

3.4.1 Generally in accordance with Section 03 20 00 for fabricating and installing steel reinforcement.

3.4.2 Set wire ties with ends directed into concrete, not toward exposed concrete surfaces.

3.5 REMOVING AND REUSING FORMS

3.5.1 Formwork for walls, columns, and similar parts of the Work, that does not support weight of concrete may be removed after cumulatively curing at not less than 10°C for 24 hours after placing concrete, provided concrete is hard enough to not be damaged by form removal operations and provided curing and protection operations are maintained:

3.5.1.1 Schedule form removal to maintain surface appearance that matches accepted mock-ups.

3.5.2 Leave formwork that supports weight of concrete in place until concrete has achieved at least 70% of 28 day design compressive strength; remove forms only if shores have been arranged to permit removal of forms without loosening or disturbing shores.
3.5.3 Clean and repair surfaces of forms to be reused in the Work:

3.5.3.1 Do not use split, frayed, delaminated, or otherwise damaged form facing material.
3.5.3.2 Apply new form release agent.

3.5.4 There should be no re-use of AEC formwork for columns. Reuse for beams and soffits only once.

3.5.4.1 When forms are reused, clean surfaces, remove fins and laitance, and tighten to close joints:
3.5.4.1.1 Align and secure joints to avoid offsets.
3.5.4.1.2 Do not use patched forms for AEC surfaces.

3.6 JOINTS

3.6.1 Refer to conditions in item 1.1.

3.6.2 Install construction joints true to line with faces perpendicular to surface plane of AEC so strength and appearance of concrete are not impaired, and as follows:

3.6.2.1 Place joints perpendicular to main reinforcement.
3.6.2.2 Continue reinforcement across construction joints, unless otherwise indicated.
3.6.2.3 Align construction joint within rustications attached to form facing material.
3.6.2.4 Space vertical joints in walls as indicated.
3.6.2.5 Locate joints beside piers integral with walls, near corners, and in concealed locations where possible.
3.6.2.6 Use epoxy bonding adhesive at locations where fresh concrete is placed against hardened or partially hardened concrete surfaces.
3.6.2.7 Obtain acceptance from Consultant where locations are not indicated.
3.6.2.8 Cold joints in columns to occur only at undersides of beams.

3.6.3 Form weakened plane contraction joints true to line with faces perpendicular to surface plane of AEC so strength and appearance of concrete are not impaired; obtain acceptance from Consultant where locations are not indicated.

3.6.4 Form keyed joints as indicated; embed a minimum of 38 mm into concrete; align construction joint within rustications attached to form facing material.

3.6.5 Locate joints as indicated on Structural Drawings for beams, slabs, joists, and girders in the middle third of spans; offset joints in girders a minimum distance of twice the beam width from a beam girder intersection.

3.6.6 Locate horizontal joints in walls and columns at underside of floors, slabs, beams, and girders and at the top of footings or floor slabs; place reveal joint at horizontal joint locations; obtain acceptance from Consultant where locations are not indicated.

3.7 CONCRETE MIXING

3.7.1 Ready Mixed Concrete: Measure, batch, mix, and deliver AEC in accordance with CSA A3000 and provide batch ticket information:

3.7.1.1 When air temperature is between 30°C and 32°C, reduce mixing and delivery time from 90 to 75 minutes.
3.7.1.2 When air temperature is above 32°C, reduce mixing and delivery time to 60 minutes.

3.8 CONCRETE PLACEMENT

3.8.1 Verify that installation of formwork, reinforcement, and embedded items is complete and that required inspections have been performed before placing concrete.
3.8.2 Place concrete in accordance with the requirements of Section 03 31 00.

3.8.3 Deposit concrete continuously between construction joints; deposit concrete to avoid segregation; deposit concrete so that form pressures do not exceed 48 kPa. Cold joints in columns to occur only at undersides of beams.

3.8.4 Thoroughly vibrate concrete to achieve good consolidation, and eliminate entrapped air to minimizing voids:

3.8.4.1 Internally vibrate through to previous lift to avoid lift lines.
3.8.4.2 Avoid vibrator contact with the form liner.

3.9 REPAIR OF SURFACE DEFECTS

3.9.1 Repair surface defects in accordance with applicable requirements of ACI 303.1.

3.9.2 Do not repair surface defects until reviewed by Consultant team, defects are defined as:

3.9.2.1 Form tie holes.
3.9.2.2 Air voids or pockets.
3.9.2.3 Bug holes with a nominal diameter or depth greater than 6 mm.
3.9.2.4 Honeycombed areas and rock pockets.
3.9.2.5 Visible construction joints.
3.9.2.6 Fins and burrs.

3.9.3 Repair surface defects using tightly bonded patching materials resulting in concrete surfaces having uniform color and texture, matching adjacent surfaces, and free of shrinkage cracks, and as follows:

3.9.3.1 Fill bug holes larger than 6 mm in diameter or depth; chip out and fill bug holes larger than 13 mm in diameter.
3.9.3.2 Remove honeycombed and other defective concrete down to sound concrete.
3.9.3.3 Saw cut edges perpendicular to the surface or slightly undercut; feather edges will not be permitted.
3.9.3.4 Dampen area being patched overlapping surrounding areas by a minimum of 150 mm to prevent absorption of water from the patching mortar into concrete.

3.9.4 Cut out to solid surface behind reinforcing steel to provide suitable key lock for patching mortar where rock pockets or similar defects or voids expose steel reinforcement so that patching mortar envelopes exposed reinforcing steel.

3.9.5 Bond patching mortar to concrete with bonding grout or epoxy adhesive brushed deeply into concrete surfaces in accordance with patching mortar manufacturer’s instructions:

3.9.5.1 Colour match patching mortar to surrounding concrete when dry; determine proportion of white portland cement and colourant by trial mixes and test areas before starting repairs to actual defective areas.
3.9.5.2 Compact mortar into place and strike off to leave patch slightly higher than surrounding surface.
3.9.5.3 Leave patch undisturbed for at least 1 hour before being finally finished to permit initial shrinkage.
3.9.5.4 Keep patched area damp for 7 days to allow damp cure.

3.9.6 Neatly finish patched surfaces to match adjacent surrounding surface texture of concrete; grind or fill surfaces to produce level and plumb, true planes.

3.9.7 Ream, patch and finish form tie holes flush with adjacent surface for walls exposed in finished work; use a plunger type injection gun or other suitable device to completely fill holes passing entirely through walls.
3.9.8 Cut out honeycombs and rock pockets that are too large and unsatisfactory for mortar patching to solid surface, keyed and packed solid with matching concrete to produce firm bond and flush surface; patch shall match texture of adjacent surfaces where exposed in finished work.

3.9.9 Remove and reapply repair work in exposed locations that does not match the texture and colour of surrounding adjacent surfaces or that is not performed to workmanship standards established by sample panels and mock-ups until repair work conforms with specified requirements.

3.9.10 Cure completed repairs the same as for AEC as specified in Article 3.10 below.

3.10 CONCRETE CURING

3.10.1 Protect freshly placed concrete from premature drying and excessive cold or hot temperatures in accordance with ACI 301.1.

3.10.2 Begin curing immediately from applying as cast formed finishes to concrete; cure by one or a combination of the following methods that will not mottle, discolor, or stain concrete:

3.10.2.1 Maintain Formwork In Place:
3.10.2.1.1 Keep concrete formwork in place to act as moisture retaining cover for curing concrete.
3.10.2.1.2 Cure for not less than fourteen days.
3.10.2.1.3 Cover interior concrete surfaces with moisture retaining cover and protect from exposure to weather until permanent enclosure of building is achieved; placed in widest practicable width, with sides and ends lapped at least 300 mm, and sealed by waterproof tape or adhesive.

3.10.2.2 Moisture Curing: Keep exposed surfaces of AEC continuously moist for not less than seven days with the following materials:
3.10.2.2.1 Water.
3.10.2.2.2 Continuous water fog spray.
3.10.2.2.3 Absorptive cover, water saturated and kept continuously wet. Cover concrete surfaces and edges with 300 mm lap over adjacent absorptive covers.

3.10.2.3 Moisture Retaining Cover Curing: Cover concrete surfaces with moisture retaining cover for curing concrete, placed in widest practicable width, with sides and ends lapped at least 300 mm, and sealed by waterproof tape or adhesive. Cure for not less than seven days. Immediately repair any holes or tears during curing period; use cover material and waterproof tape.

3.10.2.4 Curing Compound: Mist concrete surfaces with water. Apply curing compound uniformly in continuous operation by power spray or roller in accordance with manufacturer's written instructions. Recoat areas subjected to heavy rainfall within three hours after initial application. Maintain continuity of coating and repair damage during curing period.

3.11 SITE QUALITY CONTROL

3.11.1 Generally in accordance with requirements for site quality control requirements specified in Section 03 31 00.

3.12 PROTECTION AND CLEANING

3.12.1 Protect corners, edges, and surfaces of AEC from damage; use guards and barricades.

3.12.2 Protect columns using 2 440 mm high plywood surround applied to columns immediately after form removal, to keep AEC damage to a minimum.
3.12.3 Protect AEC from staining, laitance, and contamination during remainder of construction period with use of tarps applied to any exposed rebar in columns immediately, to remain until next placement is cast.

3.12.4 Clean AEC surfaces after finish treatment to remove stains, markings, dust, and debris.

3.12.5 Wash and rinse surfaces in accordance with concrete finish applicator's written recommendations:
   3.12.5.1 Protect other Work from staining or damage due to cleaning operations.
   3.12.5.2 Do not use cleaning materials or processes that could change the appearance of AEC finishes.

3.12.6 Protect surfaces of AEC from marks arising from subsequent components of work; use of felt tip markers and other forms of permanent marker or staining materials will not be permitted on completed AEC.

3.13 ANTI-GRAFFITI COATING

3.13.1 Apply anti-graffiti coating in accordance with Section 09 96 23, to areas as directed by Consultant, in accordance with manufacturer's written instructions and as follows:
   3.13.1.1 Cure concrete and concrete repairs a minimum of 28 days.
   3.13.1.2 Apply solution in a three coat application using approved spray equipment at rate in accordance with manufacturer's written instructions.
   3.13.1.3 Protect non porous surfaces from overspray.

END OF SECTION
1 General

1.1 SUMMARY

1.1.1 Work of this section specifies concrete floor finishing techniques and includes floor finishing treatments, testing and measurement for floor flatness and levelness, and trowelling, levelling, and floating of floor surfaces ready for applied finishes; and includes treatment of formed concrete surfaces to achieve specified surface characteristics for non-architecturally finished concrete.

1.1.2 Proposed testing and floor finishing techniques in this section can assist the Trade Contractor to improve floor flatness and levelness to avoid extensive flash patching and grinding on suspended floor slabs.

1.2 RELATED REQUIREMENTS

1.2.1 Section 03 10 00 – Concrete Forming and Accessories: Coordinate camber of floor formwork and shoring to account for final floor flatness and levelness described in this Section.

1.2.2 Section 03 30 00 – Cast-In-Place Concrete: Requirements for concrete testing, and floor flatness and levelness requirements; requirements for curing methods and length of cure.

1.2.3 Section 03 33 00 – Architecturally Exposed Concrete: Coordinate trowelled, stained or surface applied concrete finishes with finishing operations of this Section.

1.2.4 Section 03 35 43 - Polished Concrete Finishing: Coordinate trowelled surface applied concrete finishes with finishing operations of this Section.

1.2.5 Section 05 12 00 – Structural Steel: Coordinate cambered or non-cambered structural steel framing that affect levelness requirements specified in this Section.

1.2.6 Section 05 31 00 – Steel Deck: Coordinate steel deck deflection criteria that affect levelness requirements specified in this Section.

1.2.7 Section 12 48 16 – Entrance Floor Grilles: Screed for recessed grilles block outs with self levelling grout.

1.3 DEFINITIONS

1.3.1 Floor Types: Types of concrete floor slabs based on their intended use, methods of finishing and finish materials applied to flooring as required to achieve Finishing Class listed below, and as follows:

1.3.1.1 Single Course Floor: Floors placed in a single course with final finishing applied to properly levelled concrete.

1.3.2 Finish or Finishes: Materials applied to finished concrete surface, such as stained or coloured concrete, carpet, resilient flooring or ceramic tile.

1.3.3 Finishing Class: Methods, tools and equipment employed to achieve levelness or surface flatness for shored slabs and slabs-on-grade and as follows:

1.3.3.1 F0-Finishing: Not Used

1.3.3.2 F1-Finishing: Floors having overall F-number of $F_f 20 \times F_i 15$; meeting requirements for CSA A23.1 Class A slab finishing. For slabs having non-critical floor including mechanical rooms.

1.3.3.3 F2-Finishing: Floors having overall F-number of $F_f 25 \times F_L 20$; meeting requirements for CSA A23.1 Class B slab finishing.

1.3.3.4 F3-Finishing: Floors having overall F-number of $F_f 30 \times F_L 25$; no similar CSA A23.1 slab finishing. For slabs having thin set tile and resilient sheet or tile floor finish for Institutional or Commercial floors.
1.3.3.5 F4-Finishing: Floors having overall F-number of $F_F \times F_L = 35 \times 25$; meeting requirements for CSA A23.1 Class C slab finishing.

1.3.3.6 F5-Finishing: Not Used

1.3.3.7 F6-Finishing: Not Used

1.4 REFERENCE STANDARDS

1.4.1 American Society for Testing and Materials (ASTM):

1.4.1.1 ASTM E1155-96 (2008), Standard Test Method for Determining FF Floor Flatness and FL Floor Levelness Numbers

1.4.2 American Concrete Institute (ACI):

1.4.2.1 ACI 117-10, ACI Manual of Practice: Specifications for Tolerances for Concrete Construction and Materials, and Commentary

1.4.2.2 ACI 302.1R-04, ACI Manual of Practice: Guide for Floor and Slab Construction

1.4.3 Canadian Standards Association (CSA):

1.4.3.1 CSA A23.1/A23.2-09, Concrete Materials and Methods of Concrete Construction

1.4.4 Society for Protective Coatings (SSPC)/International Concrete Repair Institute (ICRI):

1.4.4.1 SSPC/ICRI Guideline 03732, Selecting and Specifying Concrete Surface Preparation for Sealers, Coatings and Polymer Overlays

1.5 ADMINISTRATIVE REQUIREMENTS

1.5.1 Coordination: Coordinate a meeting between the Construction Manager and Trade Contractor responsible for concrete placement, and the Consultant to determine Site Quality Control testing section borders and sample measurement line locations, method of measurement, and accuracy requirements of measuring devices.

1.5.2 Pre-Construction Meetings: Arrange meeting with Construction Manager and Trade Contractor for work of this Section and other Trade Contractors affected by work of this Section in accordance with Section 01 31 19 – Project Meetings and as follows:

1.5.2.1 Hold meeting on site a minimum of 1 month prior to placing concrete floor finishes.

1.5.2.2 Review building envelope and ambient conditions.

1.5.2.3 Review specified methods and materials.

1.5.2.4 Review requirements for site mock-ups.

1.5.2.5 Review work of other sections affected by this Section including applied finishes.

1.5.2.6 Confirm joint details and layout.

1.5.2.7 Confirm quality assurance inspection procedures.

1.5.2.8 Confirm floor flatness, slab finishing and requirements of finishes installed to slabs, and other issues governing installation of concrete finishing materials.

1.6 SUBMITTALS

1.6.1 Provide required information in accordance with Section 01 33 00 – Submittal Procedures.

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

1.6.2.1 Product Data: Submit copies of purchase orders and packing slips indicating the quantity of materials required for the project, and include a copy of the manufacturer’s recommended coverage rate.
1.6.2.2 Shop Drawings: Submit shop drawings indicating proposed construction joints, isolation joints, expansion joints (exterior) and contraction joints before preconstruction meeting ready for discussion and confirmation.

1.6.3 Informational Submittals: Provide the following submittals during the course of the work:

1.6.3.1 Submit results for floor surface flatness and levelness to demonstrate compliance with specified tolerances; record the following information on a drawing indicating floor slab layout, column locations and slab penetrations:

1.6.3.1.1 Layout of test section borders with an identification number for each test section.

1.6.3.1.2 Indicate number and direction of sample measurement lines used in each test section, the starting and stopping locations and identification number that relates to the test section number.

1.6.3.1.3 Indicate elevations of all sample reading points.

1.6.3.1.4 Indicate profile curvature between all reading points separated by 600 mm.

1.6.3.1.5 Indicate variance from estimated flatness and levelness at each measuring point tolerances using associated 90\% confidence interval in parentheses, for example \( F_F \) 25 (23.0 to 27.0), and as follows:

- \( F_F \) estimate for each test sample
- \( F_F \) composite for each test section
- \( F_L \) estimate for each test sample
- \( F_L \) composite for each test section (combined test samples)
- List calculated overall \( F \)-Number results for the entire test surface as a whole number not containing a confidence interval.

1.6.4 Sustainable Design Submittals: Coordinate project sustainable design requirements with Section 01 35 31 - LEED Special Project Procedures and Section 01 35 31A - LEED Material Information Sheet for LEED Submittals.

1.7 PROJECT CLOSEOUT SUBMITTALS

1.7.1 Operation and Maintenance Data: Submit manufacturer’s written instructions for cleaning and maintenance procedures; include complete list of cleaning products required for on-going maintenance, and name of original installer and contact information in accordance with Section 01 78 23 – Operation and Maintenance Data.

1.8 QUALITY ASSURANCE

1.8.1 Qualifications: Provide proof of qualifications when requested by Consultant:

1.8.1.1 Installers: Use skilled workmen experienced in concrete finishing methods similar in complexity and extent to that required for the Work of the Contract.

2 Products

2.1 MANUFACTURERS

2.1.1 Acceptable Materials Manufacturers: Subject to compliance with requirements specified in this Section; where multiple listings of manufacturers occur, use any of the following listed manufacturers’ products in accordance with Section 01 62 00 – Product Options including the following:
2.1.1.1 Ardex Engineered Cements
2.1.1.2 Curecrete Chemical Company
2.1.1.3 Dayton Superior
2.1.1.4 Euclid Chemical Company
2.1.1.5 Evonik Industries
2.1.1.6 L & M Construction Chemicals
2.1.1.7 L.M. Scofield Company
2.1.1.8 MAPEI Canada Inc.
2.1.1.9 Proseco Inc. Consolideck
2.1.1.10 Sika Canada Ltd.
2.1.1.11 W.R. Meadows of Canada

2.1.2 Substitutions: Consultant may consider additional manufacturers having similar products to Acceptable Materials Manufacturers listed above during the construction period, provided they meet the performance requirements established by the named products and provided they submit requests for substitution in accordance with Section 01 25 00 – Substitution Procedures before starting any work of this Section:

2.1.2.1 Do not use substitute materials to establish Bid Price.
2.1.2.2 Substitutions that appear as a part of the project without review and acceptance by the Consultant will be rejected, and replaced with one of the specified materials.

2.2 CONCRETE MATERIALS
2.2.1 Concrete Formwork: Specified in accordance with Section 03 10 00
2.2.2 Concrete Materials and Reinforcement: Specified in accordance with Section 03 30 00.
2.2.3 Curing Materials: Specified in accordance with Section 03 30 00.

2.3 LEVELLING MATERIALS
2.3.1 Underlayment: Cementitious, self levelling, single component, polymer modified underlayment with manufacturer’s recommended primer and crack repair materials; for application thicknesses to a minimum feather edge to 13 mm; interior grade and as follows:

2.3.1.1 Acceptable Materials:
   2.3.1.1.1 Ardex K 15 Premium Self Levelling Underlayment
   2.3.1.1.2 MAPEI Planipatch
   2.3.1.1.3 Sika Sikafloor Level 12
   2.3.1.1.4 W.R. Meadows Sure-Flo ST

2.3.2 Overlay: Cementitious, self levelling, single component, polymer modified overlay with manufacturer’s recommended primer and crack repair materials; for application thicknesses to a minimum of 6 mm with additional aggregates recommended by manufacturer to achieve total thickness required; and as follows:

2.3.2.1 Acceptable Materials:
   2.3.2.1.1 Ardex SD-T Cement Based Topping
   2.3.2.1.2 MAPEI Ultratop
   2.3.2.1.3 Sika Sikafloor Level 25
   2.3.2.1.4 W.R. Meadows Sure-Flo FT 100
2.3.3 Patching and Flash Patching Materials: Cementitious based, polymer modified, fine aggregate, single component, rapid curing, early strength floor patching compounds having high adhesion with manufacturer’s recommended primer and surface profile; for application in thicknesses to a minimum of 4 mm to 25 mm, and as follows:

2.3.3.1 Acceptable Materials:
2.3.3.1.1 Ardex SD-P
2.3.3.1.2 MAPEI Mapicem 101
2.3.3.1.3 Sika SikaQuick 1000
2.3.3.1.4 W.R. Meadows Sealight Meadow-Crete H

2.4 LIQUID APPLIED FINISHING MATERIALS

2.4.1 Concrete Densifier and Chemical Hardener: Ready-to-use, liquid applied anti-dusting treatment, concrete densifier and chemical hardener that does not require surface rinsing or brushing; water based, colourless liquid formulated with chemically reactive lithium-silicate compound having maximum VOC content or less than stated above, and as follows:

2.4.1.1 Acceptable Materials:
2.4.1.1.1 Euclid Chemical Company, Ultrasil Li+
2.4.1.1.2 L & M Construction Chemicals, LiON Hard
2.4.1.1.3 Prosoco, Consolideck LS/CS
2.4.1.1.4 W.R. Meadows, Liqui-Hard Ultra

3 Execution

3.1 WORKMANSHIP

3.1.1 Prepare floor slabs in accordance with Table 22 of CSA A23.1, ACI 302.1R and as modified by this specification.

3.2 FORMED SURFACES

3.2.1 Requirements listed below apply to normal structural concrete; refer to Section 03 33 00 for additional requirements for formed exposed architectural concrete.

3.2.2 Unspecified Finish: Provide following finishes as applicable when finish of formed surfaces is not specifically indicated:
3.2.2.1 Rough form finish for all concrete surfaces not exposed to public view.
3.2.2.2 Smooth form finish for all concrete surfaces exposed to public view.

3.2.3 Rough Form Finish: Leave surfaces with texture imparted by forms; patch tie holes and defects; remove fins longer than 6 mm high.

3.2.4 Smooth Form Finish: Coordinate as necessary to secure form construction using smooth, hard, uniform surfaces with number of seams kept to a minimum, uniformly spaced in an orderly pattern; patch tie holes and defects; completely remove fins.

3.2.5 Related Unformed Finish: Strike-off concrete smooth and finish with using texture matching adjacent formed surfaces at tops of walls, horizontal offsets, and similar unformed surfaces occurring adjacent to formed surfaces; continue final surface treatment of formed surfaces uniformly across adjacent unformed surfaces.

3.3 FINISHING FLOORS AND SLAB SURFACES

3.3.1 Finish floors and slabs in general conformance with CSA A23.1 and ACI 302.1R recommendations for screeding, re-straightening, and finishing operations for concrete surfaces; do not wet concrete surfaces while finishing.
3.3.2 Sealers and Curing Aids: Application of sealers and curing aids listed in Section 03 30 00 or forming a part of work referenced by other related requirements will not be permitted on floors receiving subsequent floor covering systems; application of sealers or curing aids will require re-profiling of the surface and application of cementitious topping by this Section that is acceptable to work affected.

3.3.3 Unspecified Finishing: Provide following finishing classes as applicable when finishing requirements for floors is not specifically indicated:

- **3.3.3.1 Exterior Slabs:** F2-Finishing Class with a broom finish.
- **3.3.3.2 Interior Slabs:** F3-Finishing Class with a trowelled finish.

3.3.4 Float Finishing: Consolidate surface; re-straighten, cut down high spots, and fill low spots; repeat float passes and re-straightening until surface is left with a uniform, smooth, granular texture and as follows:

- **3.3.4.1** Finish to F2-Finishing Class when float is the final finish; provide additional finishing as indicated below for surfaces requiring additional flatness tolerances.
- **3.3.4.2** Apply float finishing to surfaces receiving trowel finishing and receiving fluid applied high build coating.

3.3.5 Trowel Finishing: Commence trowel finishing once float finishing is completed, after all bleed water has disappeared and when concrete has stiffened sufficiently to prevent working excess mortar to surface; use power driven floats or hand floating for areas that are inaccessible to power driven floats, and as follows:

- **3.3.5.1** Finish to F3-Finishing Class; except that F4-Finishing Class is required for floors receiving ground and polished concrete finish.
- **3.3.5.2** Apply a trowel finishing to surfaces covered with resilient flooring, carpet, ceramic or quarry tile set over a cleavage membrane, paint, or another thin film finish coating system.

3.3.6 Trowel and Fine Broom Finishing: Apply trowel finishing to surfaces where large format porcelain tile is scheduled for installation by either thickset or thin set method; finish to F4-Finishing Class.

3.3.7 Broom Finishing: Apply broom finishing to exterior concrete platforms, steps, and ramps; slightly roughen trafficked surface by brooming perpendicular to main traffic route immediately after float finishing.

3.3.8 Liquid Applied Floor Hardener Finishing: Apply liquid floor densifier to surfaces in accordance with manufacturer’s written instructions after curing of concrete, a minimum of 8 days after concrete placement or when sufficient free lime is available to react with sodium silicate.

3.4 SITE QUALITY CONTROL

3.4.1 Testing and Measurements for Slabs-on-Grade: Make floor surface $F_F$ and $F_L$ measurements in accordance with CSA A23.1 within 72 hours of placement to confirm installation tolerances, and report results and corrective actions as indicated above for Informational Submittals.

3.4.2 Testing and Measurements for Suspended Slabs: Make floor surface $FF$ and $FL$ measurements in accordance with CSA A23.1 within 72 hours of placement to confirm installation tolerances before shoring is removed; with the following additional requirements:

- **3.4.2.1** Layout measurement lines at 45° to the framing direction; to avoid taking measurements at points where anticipated deflections are similar.
3.4.2.2 Offset measurement lines a minimum of 600 mm from column locations, and no portion of the measurement line shall fall within 600 mm of the boundary line, except where 25% of test section would be excluded from this measurement criteria.

3.4.2.3 Measurement of \( F_L \) for suspended slab tolerances shall be within 80% of the values for slabs-on-grade.

3.4.2.4 Measure and record elevation points at every 600 mm along length of test line.

3.4.3 Failed tests in excess the following floor surface \( F_F \) and \( F_L \) tolerances will require the Trade Contractor to flash patch floor to achieve specified tolerance; example of tolerance failure:

3.4.3.1 Slabs-on-Grade: Measurements in excess of 50% of the average flatness requirement will be considered as a failed test and will require flash patching.

3.4.3.2 Suspended Slabs: Measurement in excess of 80% of the average flatness requirement will be considered as a failed test and will require flash patching.

3.4.4 Non-Conforming Work: Repair concrete floor slabs where they exceed the tolerances listed above using the following methods:

3.4.4.1 Floor Level Excess (High Spots): Grind and smooth surface areas that are above listed tolerances; limited to a maximum 5 mm of surface removal after which the Bird Bath procedure will be used to fill low areas.

3.4.4.2 Floor Level Deficiency (Bird Baths): Saw cut perimeter of surface areas that are lower than listed tolerances to a minimum depth of 3 mm and as follows:

3.4.4.2.1 Grind perimeter to a minimum of 6 mm to allow for flush flash patching.

3.4.4.2.2 Roughen surface of flash patch area to a minimum ICRI CSP 5 – Medium Shotblast.

3.4.4.2.3 Clean flash patch area and trowel in floor levelling mortar in accordance with manufacturers written instructions.

3.4.4.2.4 Smooth and level surface of flash patch to match adjacent floor surfaces.

3.4.4.3 Leave floors ready for applied floor finishes supplied and installed by other sections.

END OF SECTION
1 General

1.1 SUMMARY

1.1.1 Provide a polished and hardened concrete surface to existing concrete slabs, for a smooth, slip resistant finish.

1.1.2 Concrete materials and finishing specified in this Section are intended to act as the primary finish for floors on the project; and as such, must be protected from contaminants and traffic that have potential to detract from the final appearance such as cutting oils, food or drinks, permanent markers, vehicles and other applied permanent finishes for the duration of construction.

1.2 RELATED REQUIREMENTS

1.2.1 Section 03 30 00 Cast-in-Place Concrete: Concrete curing requirements and concrete mix design for polished concrete floors.

1.2.2 Section 03 35 00 – Concrete Finishing: Concrete placing and levelling requirements for steel trowel finished slabs.

1.2.3 Section 09 06 00 – Schedules for Finishes

1.3 DEFINITIONS

1.3.1 Polished Concrete Flooring: Mechanical grounding and polishing treatment applied to chemically densified and hardened concrete required to achieve specified sheen level using dry polishing methods to the greatest extent possible; wet polishing will not be permitted.

1.3.2 Aggregate Exposure Class: Depth of grind to achieve required appearance as follows:

1.3.2.1 Cream: Minimal surface cut with little or no aggregate exposure.

1.3.3 Reflective Clarity and Sheen: Amount of clarity when viewed from 1500 mm above and perpendicular to surface when viewing reflection of overhead objects; and reflective sheen when viewed at 6 metres from and at an angle to a surface and the degree of gloss reflected from that surface; and as follows:

1.3.3.1 Ground: Flat appearance with no to very slight diffused reflection clarity and having no or very low reflective sheen.

1.3.3.2 Honed: Matte appearance with slight diffused reflection clarity and having a low to medium reflective sheen.

1.3.3.3 Semi-Polished: Soft or muted reflection clarity with reflected objects being identifiable and having a medium to high reflective sheen.

1.3.3.4 Highly-Polished: Sharp and crisp reflection clarity and having a high to very high, mirror like sheen.

1.4 REFERENCE STANDARDS

1.4.1 Concrete Polishing Association of America (CPAA):

1.4.1.1 CPAA - Bonded Abrasive Polished Concrete Definitions

1.5 ADMINISTRATIVE REQUIREMENTS

1.5.1 Coordination: Coordinate with Section 03 31 00 for wet curing methods and that any liquid curing compounds; whether specified or not, and that may have been applied to concrete slabs is fully removed before starting work of this Section.
1.5.2 Preconstruction Meeting: Arrange a preconstruction meeting in accordance with Section 01 31 19 – Project Meetings including Consultant Construction Manager, Trade Contractor for work of this Section and other components of the work to discuss effects and issues governing installation of polished concrete floor finishes including protection of concrete surfaces from marking pens, cutting oils and other deleterious materials that could damage the final finish; identify area for project mock-up; and to obtain clear direction from the Consultant about the desired outcome and expected effects of polished concrete application.

1.6 SUBMITTALS

1.6.1 Provide required information in accordance with Section 01 33 00 – Submittal Procedures.

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

1.6.2.1 Product Data: Submit product data for each grinding and polishing machine; include information on types of grinding heads, dust extraction, water control and concrete densifier materials.

1.6.2.2 Samples: Submit minimum 300 mm x 300 mm sample indicating rustic terrazzo concrete finish specified in this section.

1.6.3 Sustainable Design Submittals: Coordinate project sustainable design requirements with Section 01 35 31 - LEED Special Project Procedures and Section 01 35 31A - LEED Material Information Sheet for LEED Submittals.

1.7 PROJECT CLOSEOUT SUBMISSIONS

1.7.1 Operation and Maintenance Data: Submit manufacturer’s written cleaning and maintenance instructions for applied finishes and instruct Owner in proper care and maintenance of specified floor finishes; include a complete list of floor care products that will be required for ongoing maintenance and name of original installer and contact information in accordance with Section 01 78 23 – Operation and Maintenance Data.

1.8 QUALITY ASSURANCE

1.8.1 Qualifications: Provide proof of qualifications when requested by Consultant:

1.8.1.1 Installers: Use skilled workmen experienced in concrete finishing methods similar in complexity and extent to that required for the Work of the Contract.

1.9 MOCK-UPS

1.9.1 Provide required Mock-Ups and sample installation in accordance with Section 01 45 00 – Quality Control.

1.9.2 Provide Mock-ups of honed floors being provided, three of them at 3 m x 2 m each, with different levels of sheen for review by architectural team.

1.9.3 Construct Mock-ups in an area that will receive applied floor finishes, and will be covered when those materials are installed and as follows:

1.9.3.1 Evaluation: Consultant will evaluate finish and may request changes or variation or additional Mock-ups of materials.

1.9.3.2 Patching: Damage an area of polished concrete and repair using materials and clear polymer resin proposed for use on project; demonstrate patching methods that will be used to repair damaged concrete surfaces.

1.9.3.3 Acceptance: Accepted mock-up will form the standard for remaining rustic terrazzo concrete work, but will not form a part of the total work.
1.10 DELIVERY, STORAGE AND HANDLING

1.10.1 Delivery and Acceptance Requirements: Deliver materials to prevent damage to containers or bags, or damage from freezing or over heating; store materials in a clean, dry, heated location until ready for use.

1.11 SITE CONDITIONS

1.11.1 Ambient Conditions: Install when area is clean and ready for finishing operations; having sufficient water, temporary heat and light, and adequate power and outlets for operation of floor grinding and polishing equipment and temperature is within manufacturers recommended range.

2 Products

2.1 MANUFACTURERS

2.1.1 Basis-of-Design Products: Products named in this Section were used as the basis-of-design for the project; manufacturers listed as additional acceptable materials 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.

2.1.1.1 Basis-of-Design Product: Advanced Floor Products, RetroPlate Concrete Polishing System

2.1.2 Additional Acceptable Materials Manufacturers: Subject to [matching of colour and] compliance with performance requirements specified in this Section; as established by the Basis-of-Design Materials, use any of the listed manufacturers’ products in accordance with Section 01 62 00 – Product Options following manufacturer’s do not require submission of a request for substitutions provided shop drawing and product data submissions are submitted before starting any work of Section:

2.1.2.1 Convergent Concrete Technologies
2.1.2.2 Prosoco Inc. Consolideck
2.1.2.3 W.R. Meadows Inc. Induroshine

2.1.3 Substitutions: Consultant may consider additional manufacturers having similar products to Acceptable Materials Manufacturers listed above during the construction period, provided they meet the performance requirements established by the named products and provided they submit requests for substitution in accordance with 01 25 00 – Substitution Procedures before starting any work of this Section:

2.1.3.1 Do not use substitute materials to establish Bid Price.
2.1.3.2 Substitutions that appear as a part of the project without review and acceptance by the Consultant will be rejected, and replaced with one of the specified materials.

2.2 MATERIALS

2.2.1 Concrete Polishing and Grinding Heads: Sized for machinery required for project; hand held and walk behind machinery as required for project requirements and specified gloss levels.

2.2.2 Concrete Densifier and Chemical Hardener: Ready-to-use, liquid applied concrete densifier and chemical hardener that does not require surface rinsing or brushing; water based, colourless liquid formulated with chemically reactive lithium-silicate compound having maximum VOC content or less than stated above, and as follows:

2.2.2.1 Acceptable Materials:
2.2.2.1.1 Convergent Pentra-Sil (NL)
2.2.2.1.2 Prosoco, Consolideck LS
2.2.2.1.3 RetroPlate® Densifier
2.2.2.1.4 W.R. Meadows, Liqui-Hard Ultra

2.2.1 Saw Cut Joint Filler: Self levelling, 100% solids, two component rapid curing polyurea elastomer joint filler formulated to withstand 10 to 15% change in joint width with primer, joint backing and bond break materials, accessories and equipment required for a complete installation; meeting maximum VOC content limits stated above, and as follows:

2.2.1.1 Acceptable Materials:

2.2.1.1.1 PolyVers International PV 75 Joint Filler
2.2.1.1.2 VersaFlex Incorporated SL/75 Joint Filler

2.2.2 Patching Compound and Grout: Manufacturer’s recommended compatible cementitious/limestone/vinyl-acetate patching compound or clear epoxy-polyurethane resin grout; coloured and textured with grind material to match adjacent polished concrete surfaces; and forming a tenacious bond to concrete.

2.2.3 Equipment: Manufacturer’s recommended equipment with dust extraction system including the following:

2.2.3.1 Field Area Grinding and Polishing: Walk-behind machines having sufficient down pressure weight to achieve specified levels of finish.
2.2.3.2 Edge and Detailing Area Grinding and Polishing: Hand held or walk behind machines capable of providing same finish as field area grinding and polishing equipment.
2.2.3.3 Polishing and Grinding Pads: Diamond embedded grinding pads of varying grits, compatible with grinding and polishing equipment to achieve specified levels of finish.
2.2.3.4 Burnishing Equipment: High speed walk-behind or ride-on machines; having sufficient down pressure weight and revolutions to heat floor surface; with high speed burnishing pads compatible with equipment and as required to achieve specified levels of gloss.
2.2.3.5 Other Equipment: Provide additional equipment as required to complete polished concrete flooring installation.

2.3 FINISH

2.3.1 Level of grinding: RetroPlate Class A – Cream, No exposed aggregate.
2.3.2 Floor Finish: RetroPlate Honing, Level 3, Hard-shell, medium sheen finish (800 grit).

3 Execution

3.1 EXAMINATION

3.1.1 Examine areas to receive rustic terrazzo concrete for defects in existing work that affect proper execution of concrete floor polishing work.
3.1.2 Start work only when all defects have been corrected.

3.2 PREPARATION

3.2.1 Protect floor areas identified for polished concrete finishes from other trades, communicate to other trades that marking pens, cutting oils or contact from other substances deleterious to final finish will not be permitted.
3.2.2 Verify that floor surface is free from materials that could affect chemical hardening and polishing process; and that concrete is sufficiently cured to permit chemical hardening reaction.
3.2.3 Protect adjacent surfaces not designated to receive treatment; confirm that specified treatments can penetrate concrete surfaces.
3.2.4 Fill saw cut control joints with manufacturer recommended joint filler to prevent spalling and chipping of joint edges.

3.3 INSTALLATION

3.3.1 Concrete Densifier: Apply liquid floor densifier to surfaces in accordance with manufacturer’s written instructions after initial floating; cure concrete in accordance with manufacturer’s recommended procedures for a minimum of 28 days until sufficient free lime is available to activate the chemical hardening process and as follows:

3.3.1.1 Apply densifier at rate recommended by manufacturer.
3.3.1.2 Do not dilute except as specifically stated by manufacturer.
3.3.1.3 Squeegee puddles as they occur.

3.3.2 Floor Grinding and Polishing: Grind and polish concrete using progressively finer diamond polishing pads as required to achieve Cream Exposure Class, and Honed Sheen, and as follows:

3.3.2.1 Fill joints and cracks, surface voids, and pits arising from loss of aggregate that become apparent during the grinding operations in accordance with manufacturer’s instructions before final grinding stage.
3.3.2.2 Grind and polish concrete floors using only dry counter rotating, vacuum shrouded walk behind machines to the greatest extent possible; finish areas inaccessible to walk behind machines with hand held grinders and polishers to match the appearance of the field areas.
3.3.2.3 Vacuum and squeegee floors after each grinding step.
3.3.2.4 Remove construction debris on an ongoing basis
3.3.2.5 Clean floor thoroughly using clean water and auto-scrubber with wet vacuum attachment.

3.3.3 Patching Polished Concrete: Conserve grinding debris from each area for use as a component in patching materials and as follows:

3.3.3.1 Mix grinding debris with patching compound to achieve colouration and surface appearance similar to adjacent surfaces.
3.3.3.2 Patch tear outs and edge spalling using manufacturer’s patching compound compatible with concrete polishing materials and methods.
3.3.3.3 Select patching compound or grout based on extent and depth of patches and repairs required to prepare floor surfaces ready for finishing.
3.3.3.4 Patch as work progresses and polish to match adjacent finished surfaces.

3.4 PROJECT CLOSEOUT

3.4.1 Protection: Cover polished concrete flooring after completion with protective coverings to protect finished surfaces for activities arising from subsequent construction.

3.4.2 Demonstration: Train Owner’s designated maintenance personnel in the care and upkeep of polished and slip resistant concrete finishes, based on written maintenance instructions provided in accordance with Section 01 77 00 – Closeout Procedures.

END OF SECTION
1 General

1.1 SUMMARY

1.1.1 This section describes the requirements for design, supply, delivery and installation of precast concrete architectural wall panels (Wall Type: WT-15), and application of site applied penetrating surface sealant and joint sealants.

1.1.2 This section shall be responsible for reviewing shop drawings of structural steel supplier and coordinating information for installation of bracing, supports, inserts and similar accessories that are required for work under this contract and that shall be supplied and installed by other Sections of the Work.

1.1.3 These sections shall take delivery and cast into precast workboxes, inserts, and openings required by other Sections of the Work.

1.1.4 Drawings contain details that suggest directions for solving some of the major design requirements; these details can be developed further by the Trade Contractor provided that the final installation adheres to aesthetic criteria established by the drawings and specified dimensions with all elements in planes as drawn, maintaining their relationships with all other building elements.

1.2 RELATED REQUIREMENTS

1.2.1 Section 03 30 00 – Cast-in-Place Concrete: Setting only of inserts or anchors required for architectural precast concrete.

1.2.2 Section 03 33 00 - Architecturally Exposed Concrete

1.2.3 Section 04 81 00 – Unit Masonry Assemblies

1.2.4 Section 05 12 00 – Structural Steel Framing: Bracing and structural items required by this section, but supplied and installed by other work of the Project.

1.2.5 Section 05 41 00 – Structural Metal Stud Framing

1.2.6 Section 05 50 00 – Metal Fabrications: Embed plates, lintels and structural items for substrates required by this section, supplied by this section, but turned over to other work of the Project for installation.

1.2.7 Section 07 21 13.13 – Semi-Rigid Board Insulation

1.2.8 Section 07 21 19 – Foamed-In-Place Insulation.

1.2.9 Section 07 84 00 – Firestopping

1.2.10 Section 07 92 00 – Joint Sealants: Sealants and joint fillers.

1.2.11 Section 08 11 13 – Steel Doors and Frames

1.2.12 Section 08 44 13 – Glazed Aluminum Curtain Walls

1.3 DEFINITIONS

1.3.1 Delegated Design Professional Engineer: The professional engineer hired or contracted to the fabricator or manufacturer to produce delegated design submittals and shop drawings to meet the requirements of the Project, and registered in the province of the Work, and who is not the Consultant.

1.3.2 Equal Dimensions: Precast panels and items indicating equal dimensions on the drawings shall be calculated to align with in-place structural elements followed by even division of the space between structural elements. This shall mean that precast items are evenly spaced between adjacent structural members, not necessarily evenly spaced across the entire wall assembly.
1.4 REFERENCE STANDARDS

1.4.1 American Society for Testing and Materials (ASTM):

1.4.1.1 ASTM A123/A123M-13, Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products
1.4.1.2 ASTM C260-06, Standard Specification for Air-Entraining Admixtures for Concrete
1.4.1.3 ASTM C494/C494M-08A, Standard Specification for Chemical Admixtures for Concrete
1.4.1.4 ASTM D412-06AE1, Standard Test Methods for Vulcanized Rubber and Thermoplastic Rubbers and Thermoplastic Elastomers-Tension
1.4.1.5 ASTM D2240-05, Standard Test Method for Rubber Property-Durometer Hardness

1.4.2 Canadian General Standards Board (CGSB):

1.4.2.1 CAN/CGSB-1.40-97, Anticorrosive Structural Steel Alkyd Primer
1.4.2.2 CAN/CGSB-1.181-99, Ready-Mixed Organic Zinc-Rich Coating

1.4.3 Canadian Precast Prestressed Concrete Institute (CPCI):

1.4.3.1 CPCI Handbook
1.4.3.2 CPCI Precast Concrete Certification Program for Architectural and Structural Precast Concrete Products and Systems

1.4.4 Canadian Standards Association (CSA):

1.4.4.1 CAN/CSA A23.1-04/A23.2-04, Concrete Materials and Methods of Concrete Construction
1.4.4.2 CAN/CSA A23.3-04, Design of Concrete Structures
1.4.4.3 CSA A23.4-05, Precast Concrete - Materials and Construction
1.4.4.4 CSA A283-06, Qualification Code for Concrete Testing Laboratories
1.4.4.5 CAN/CSA A3000-08, Cementitious Materials Compendium
1.4.4.6 CSA G30.18-09, Carbon Steel Bars for Concrete Reinforcement
1.4.4.7 CSA G40.20-13/G40.21-13, General Requirements for Rolled or Welded Structural Quality Steel Structural Quality Steel
1.4.4.8 CSA W47.1-09, Certification of Companies for Fusion Welding of Steel
1.4.4.9 CSA W186-M1990 (R2007), Welding of Reinforcing Bars in Reinforced Concrete Construction

1.4.5 Precast/Prestressed Concrete Institute (PCI):

1.4.5.1 PCI MNL 116-99, Quality Control for Plants and Production of Structural Precast and Prestressed Concrete Products
1.4.5.2 PCI MNL 117-96, Quality Control for Plants and Production of Architectural Precast and Prestressed Concrete Products
1.4.5.3 PCI MNL 120-04, PCI Design Handbook, 6th Edition

1.5 ADMINISTRATION REQUIREMENTS

1.5.1 Preinstallation Conference: Conduct conference at Project site to comply with requirements in Section 01 31 19 – Project Meetings, attended by Construction Manager, Consultant and Owner to discuss the following:

1.5.2 Coordination: Coordinate installation of anchorages and embed plates with Section 03 30 00 and Section 05 50 00, as follows:

1.5.2.1 Provide setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors, that are to be embedded in concrete or masonry.
1.5.2.2 Deliver such items to Project site in time for installation.
1.5.2.3 Provide anchorage items to be embedded in or attached to other construction without delaying the Work. Provide setting diagrams, templates, instructions, and directions, as required, for installation.

1.5.2.4 Coordinate with other work of this project and fabricate work of this section to accommodate specified tolerances.

1.6 SUBMITTALS

1.6.1 Provide required information in accordance with Section 01 33 00 – Submittal Procedures.

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

1.6.2.1 Shop Drawings: Submit shop drawings in accordance with CSA A23.3 and CSA A23.4 and, and as follows:

1.6.2.1.1 Provide fully detailed and dimensioned drawings showing method of fastening and sealing and provisions made to receive work of other Sections.

1.6.2.1.2 Indicate type of finish and other pertinent information on each shop drawing.

1.6.2.1.3 Coordinate with reviewed shop drawings relating to interface elements and show exact location of inserts and anchors cast into precast concrete units for interface elements.

1.6.2.1.4 Show system of identifying units for erection purposes on shop drawings and apply similar mark on precast concrete units at time of manufacture.

1.6.2.1.5 Provide shop drawings to and obtain approvals from the authorities having jurisdiction prior to fabrication of the precast panels, when required by the authorities having jurisdiction.

1.6.2.1.6 Shop drawings shall bear stamp and signature of qualified professional engineer registered in the province of the Work.

1.6.2.1.7 Submit shop drawing indicating proposed layout of form liner for creation of form liner imprint variety for review by the Consultant.

1.6.2.2 Samples: Submit samples of precast cladding for review by Consultant as follows:

1.6.2.2.1 Sample Size: 300 mm x 300 mm x 25 mm.

1.6.2.2.2 Finish: Exposed face as described under item 2.12 below.

1.6.3 Informational Submittals: Provide the following submittals when requested by the Consultant:

1.6.3.1 Certificates: Submit proof of certification prior to starting work of this section appropriate to the work of this section as follows:

1.6.3.1.1 Class A Precast Concrete Products – Architectural; Prestressed or Non-Prestressed as indicated on drawings.

1.6.3.2 Design Notes: Submit relevant design data prepared by a registered structural engineer for review when requested by the Consultant, and as follows:

1.6.3.2.1 Submit sketches and design calculations for non-standard connections.

1.6.3.2.2 Design and detail connections; not detailed on the drawings, and required by the fabricator for the loads indicated on the drawing or \( \frac{1}{2} \) of uniformly distributed factored loads for laterally supported beams in the Handbook of Steel Construction.
1.6.4 Sustainable Design Submittals: Coordinate project sustainable design requirements with Section 01 35 31 - LEED Special Project Procedures and Section 01 35 31A - LEED Material Information Sheet for LEED Submittals.

1.7 QUALITY ASSURANCE

1.7.1 Regulatory Requirements: Materials and workmanship shall to conform to CSA A23.4, and as follows:

1.7.1.1 Conform to the requirements of the Building Code, and local authorities having jurisdiction; design and provide reinforcement, anchors and supports as required by codes.

1.7.2 Qualifications: Provide proof of qualifications when requested by Consultant:

1.7.2.1 Manufacturers: Use architectural precast concrete manufacturers certified to CPCI Certification Program and meeting requirements of CSA A23.4; including appendices A and B, and with PCI MNL 116 and 117 certification requirements, and as follows:

1.7.2.1.1 Having experience in manufacturing precast architectural concrete units similar to those indicated for this Project and with a record of successful in service performance.

1.7.2.1.2 Having responsibility for engineering precast architectural concrete units to comply with performance requirements; including preparation of shop drawings and comprehensive engineering analysis by a qualified professional engineer.

1.7.2.1.3 Have sufficient production capacity to produce required units without causing delay to the Work.

1.7.2.1.4 Having membership in good standing with the Canadian Precast/Prestressed Concrete Institute (CPCI) and have a proven record and satisfactory experience in the design, manufacture and erection of precast concrete facing units of the type specified.

1.7.2.1.5 Precast concrete manufacturer shall have adequate financing, equipment, plant and skilled personnel to detail, fabricate and erect the work of this Section as required by the Specification and Drawings.

1.7.2.1.6 Precast concrete manufacturer shall have plant of adequate size to maintain the required delivery schedule.

1.7.2.2 Source Quality Control: Use same brand and source of cement and aggregate for entire project to ensure uniformity of colouration and other mix characteristics.

1.8 MOCK-UPS

1.8.1 Provide required Sample Panels in accordance with Section 01 45 00 – Quality Control, and as follows:

1.8.1.1 Sample Panels:

1.8.1.1.1 Produce samples until desired colour is achieved before fabricating precast architectural concrete units, produce sample panels to establish the approved range of selections made under sample submittals to achieve the colour qualification.

1.8.1.1.2 Produce a minimum of three (3) sets of full scale sample panels, approximately 1500 mm long by 3000 mm high, to demonstrate the expected range of finish, colour, and texture variations. As well as edge, joint conditions and relationship to landscape precast elements.

1.8.1.1.3 Locate panels on site as directed by Consultant.
1.8.1.1.4 Damage part of an exposed face surface for each finish, colour, and texture, and demonstrate materials and techniques proposed for repair of surface blemishes to match adjacent undamaged surfaces.

1.8.1.1.5 Maintain sample panels during construction in an undisturbed condition as a standard for judging the completed Work.

1.8.1.1.6 Demolish and remove sample panels when directed.

1.8.1.2 Mock-ups:

1.8.1.2.1 Construct mock-ups before installing precast architectural concrete units to verify selections made under sample submittals and to demonstrate aesthetic effects and qualities of materials and execution.

1.8.1.2.2 Construct mock-ups in the location and of the size indicated on Drawing and as directed by Consultant (Architect).

1.8.1.2.3 Notify Consultant seven (7) days in advance of dates and times when mock-ups will be constructed.

1.8.1.2.4 Obtain Consultant’s (Architect) acceptance of mock-ups before starting fabrication.

1.8.1.2.5 Damage part of an exposed face for each finish, colour, and texture, and demonstrate materials and techniques proposed for repairs to match adjacent undamaged surfaces.

1.8.1.2.6 Maintain mock-ups during construction in an undisturbed condition as a standard for judging the completed work of this Section.

1.8.1.2.7 Demolish and remove mock-ups when directed.

1.9 DELIVERY, STORAGE AND HANDLING

1.9.1 Delivery and Acceptance Requirements: Precast concrete manufacturer shall accept full responsibility for delivery, handling and storage of units.

1.9.2 Storage and Handling Requirements: Deliver, handle and store precast concrete units in a near vertical plane at all times, and by methods approved by the manufacturer, and as follows:

1.9.2.1 Store units to prevent contact earth or staining influences and to prevent units from resting on corners

1.9.2.2 Remove defective units from site immediately; do not stockpile to prevent accidental use in final construction

1.9.2.3 Construct easels for stacking units and place non-staining spacers between each unit; wrap wood with polyethylene

1.9.2.4 Protect holes and reglets from water and ice during freezing weather

1.10 PROJECT CONDITIONS

1.10.1 Site Measurements: Verify dimensions by site measurements before fabrication and indicate measurements on shop drawings where precast concrete panels are indicated to fit together with other construction; coordinate fabrication schedule with construction progress to avoid delaying the Work.

1.10.2 Established Dimensions: Establish dimensions and proceed with fabricating precast concrete panels without site measurements where site measurements cannot be made without delaying the Work; coordinate construction to ensure that actual dimensions correspond to established dimensions; allow for shimming and fitting.
1.11 WARRANTY

1.11.1 Provide a written warranty in the name of the Owner warranting that the precast units will not spall, or show evidence of visible cracking resulting from inferior materials or workmanship by this section for a period of five (5) years from date of Substantial Performance.

1.11.2 Units showing such defects will be replaced and made good together with all work of other trades damaged during removal of defective precast at no expense to the Owner.

2 Products

2.1 DESIGN REQUIREMENTS

2.1.1 Design non-insulating precast concrete panels with pressure equalized joints and cavity compartmentalization in accordance with established design principles for rain screen and pressure equalization of wall systems.

2.1.2 Design concrete reinforcement and steel connections required by the Contract Documents to withstand design loadings indicated and in accordance with requirements of the Building Code to resist forces, moments, shears and allow for movements indicated, and as follows:

2.1.2.1 Design and fabricate panels, brackets and anchorage devices so that when installed they compensate for unevenness and dimensional differences in structure to which they are secured.

2.1.2.2 Compensate for structural deflection of span/360 due to live load and distortion of structure, under design criteria conditions, without imposing load on panel assembly.

2.1.2.3 Sustain precast panel loads, and superimposed wind, snow and rain loads, and seismic loads, without exceeding deflection of 1/360.

2.1.2.4 Permit no water infiltration into the building under design loads.

2.1.2.5 Wind Loads: 0.50 kPa, 1/50 year occurrence in accordance with the Building Code.

2.1.3 Engage a fabricator who utilizes a registered professional engineer to prepare calculations, shop drawings, and other structural data for architectural precast concrete panels and connections not shown on drawings that comply with the requirements of this Section.

2.1.4 Retain a delegated design professional engineer, registered in the Province of the Work to ascertain and report that fabrication and erection of work meets the specific the design criteria for materials

2.1.5 Loads indicated on Drawings are not factored.

2.2 MOULD MATERIALS

2.2.1 Moulds: Provide moulds and, where required, form facing materials of phenolic coated material that is non-reactive with concrete and dimensionally stable to produce continuous and true precast concrete surfaces within fabrication tolerances and suitable for required finishes.

2.2.2 Form Liners: Units of face design, texture, arrangement, and configuration indicated.

2.2.3 Form liner to match texture and profile depth of Basis-of-Design material with custom 89 mm board width. One form liner required 10000 m x 3000 m to allow for variation in casting for typical 1 500 mm wide panels. To mimic 90 mm boardform planks of varying length. Plank pattern is intended to vertically align from panel to panel, but vary in casting location on liner. No two identical patterns may be installed within three (3) panels of each other.

2.2.3.1 Basis-of-Design material: Reckli GmbH, custom 2/163 Fraser profile
2.3 REINFORCING MATERIALS

2.3.1 Reinforcing Steel: In accordance with CSA G30.18, Grade 400W.

2.3.2 Welded wire fabric: In accordance with CSA G30.18, Grade 400W.

2.3.3 Supports: Bolsters, chairs, spacers, and other devices for spacing, supporting, and fastening reinforcing bars and welded wire fabric in place according to PCI MNL 117; use plastic materials only.

2.3.4 Tie wire: Minimum 1.5 mm annealed wire.

2.4 CONCRETE MATERIALS

2.4.1 Cement, colouring agents, aggregates, water and admixture: in accordance with CSA A23.4 and CSA A23.1.

2.4.2 Supplementary Cementitious Materials: Metakaolin, slag, fly ash, or other replacements, meeting requirements of CSA A3001, being added to achieve coloration matching control sample.

2.4.3 Air entrainment admixture: in accordance with ASTM C260, refer to CSA A23.1, for location and exposure requirements.

2.4.4 Use of calcium chloride is not permitted.

2.4.5 Surface retardant: in accordance with ASTM C494.

2.4.6 Water: To CSA A23.1/A23.2, clear potable.

2.4.7 Water Reducing Admixture: ASTM C494, Type A.

2.4.8 Chemical admixtures: To CSA A23.1/A23.2.

2.4.9 Pozzolanic mineral admixtures: To CSA A23.5.

2.5 STEEL CONNECTION MATERIALS

2.5.1 Plates, HSS, Pins: To CSA G40.20/G40.21, Grade 300W.
2.5.2 Welding materials: in accordance with CSA W47.1 and CSA W186.

2.5.3 Galvanizing: For exterior steel items, steel in exterior walls, and items indicated for galvanizing; apply zinc coating by hot-dip process as follows:

- **2.5.3.1** To ASTM A123/A123M, minimum zinc coating of 610 g/m²

- **2.5.3.2** Galvanizing Repair Paint: High zinc dust content paint with dry film containing not less than 94% zinc dust by weight

2.5.4 Primer: For interior steel items, and high mass steel in non-weather exposed exterior locations as follows:

- **2.5.4.1** Steel Primer: In accordance with CGSB 1.40.

- **2.5.4.2** Zinc Rich Primer: In accordance with CGSB 1.181.

2.5.5 Accessories: Provide clips, hangers, plastic shims, and other accessories required to install precast architectural concrete units.

2.6 BEARING PADS

2.6.1 Provide bearing pads for precast architectural concrete units as follows:

- **2.6.1.1** Elastomeric Pads: AASHTO M251, plain, vulcanized, 100% polychloroprene (neoprene) elastomer, moulded to size or cut from a moulded sheet, 50 to 70 Shore A durometer, minimum tensile strength 15.5 MPa per ASTM D412.

- **2.6.1.2** High Density Plastic: Multimonomer, non-leaching, plastic strip.

2.7 GROUT MATERIALS

2.7.1 Sand-Cement Grout: Hydraulic cement and clean, natural sand. Mix at ratio of 1 part cement to 2 ½ parts sand, by volume, with minimum water required for placement and hydration capable of developing compressive strength of 40 MPa at 28 days.

2.7.2 Non-metallic, Non-shrink Grout: Premixed, non-metallic, non-corrosive, non-staining grout containing selected silica sands, hydraulic cement, shrinkage-compensating agents, plasticizing and water reducing agents, of consistency suitable for application.

2.8 ACCESSORIES

2.8.1 Anti-Graffiti Coating: Refer to Section 09 96 23 – Graffiti resistant Coatings.

2.8.2 Joint Sealants: Non-sag, two component materials as specified in Section 07 92 00. Colour: Shade lighter than precast concrete.

2.9 CONCRETE MIXES

2.9.1 Use grey cement in facing matrix, as required to achieve aesthetic colour qualification appearance required by Consultant as described under item 2.12 below.

2.9.2 Design mixes may be prepared by a qualified independent testing agency or by qualified precast plant personnel at precast architectural concrete fabricator's option.

2.9.3 Limit water soluble chloride ions to the maximum percentage by weight of cement permitted by CSA standard.

2.9.4 Normal Weight Concrete Face and Backup Mixes: Proportion mixes by either laboratory trial batch or site test data methods with materials to be used on Project, to provide normal weight concrete with the following properties:

- **2.9.4.1** Compressive Strength (28 Days): 34.5 MPa.

- **2.9.4.2** Maximum Water-Cementitious Materials Ratio: 0.45.
2.10 MOULD FABRICATION

2.10.1 Moulds: Accurately construct moulds, mortar tight, of sufficient strength to withstand pressures due to concrete placement operations and temperature changes and for pre-stressing operations.

2.10.2 Maintain moulds to provide completed precast architectural concrete units of shapes, lines, and dimensions indicated, within fabrication tolerances specified.

2.10.3 Edge and Corner Treatment: Uniformly 5mm radius.

2.11 PANEL FABRICATION

2.11.1 Fabricate architectural precast concrete units in accordance with CSA A23.4, and as follows:

2.11.1.1 Identify pickup points of precast architectural concrete units and orientation in structure with permanent markings, complying with markings indicated on shop drawings.

2.11.1.2 Mark each precast unit to correspond to identification mark on shop drawings for location.

2.11.1.3 Mark each precast unit with the date cast.

2.11.1.4 Verify that surfaces to receive sealant are smooth and free of laitance to provide a suitable base for adhesion.

2.11.1.5 Verify that release agents do not deleteriously affect the sealing of the joints.

2.11.1.6 Cure concrete by moisture retention without heat or by accelerated heat curing using low pressure live steam or radiant heat and moisture.

2.11.1.7 Cast panels face down in accurate rigid moulds designed to withstand high frequency vibration.

2.11.1.8 Vibrate concrete continuously during casting until full thickness is reached.

2.11.1.9 Provide necessary holes and sinkages for flashings, anchors, cramps, and similar insert items.

2.11.1.10 Separately and accurately batch cement and aggregates uniformly by weight to ensure maintenance of even and uniform appearance.

2.11.1.11 Burn off lift cables paint and fill in where required if unit is damaged due to burn off.

2.11.2 Fabricate anchorage hardware with sufficient anchorage and embedment to comply with design requirements, and as follows:

2.11.2.1 Accurately position for attachment of loose hardware, and secure in place during precasting operations.

2.11.2.2 Locate anchorage hardware where it does not affect position of main reinforcement or concrete placement.

2.11.3 Provide loose steel plates, clip angles, seat angles, anchors, dowels, cramps, hangers, and other hardware shapes for securing precast architectural concrete units to supporting and adjacent construction.

2.11.4 Cast slots, holes, and other accessories in precast architectural concrete units to receive windows, dowels, water stops, flashings, and other similar work as indicated.

2.11.5 Fabricate and place reinforcement in accordance with recommendations in CPCI Manual of Standard Practice and PCI MNL 117 for fabricating, placing, and supporting reinforcement, and as follows:

2.11.5.1 Clean reinforcement of loose rust and mill scale, earth, and other materials that reduce or destroy the bond with concrete.
2.11.5.2 Accurately position, support, and secure reinforcement against displacement during concrete-placement and consolidation operations. Completely conceal support devices to prevent exposure on finished surfaces.

2.11.5.3 Place reinforcement to maintain at least 19 mm minimum coverage. Arrange, space, and securely tie bars and bar supports to hold reinforcement in position while placing concrete. Direct wire tie ends away from finished, exposed concrete surfaces.

2.11.5.4 Install welded wire fabric in lengths as long as practicable. Lap adjoining pieces at least one full mesh and lace splices with wire. Offset laps of adjoining widths to prevent continuous laps in either direction.

2.11.5.5 Set reinforcing anchors and auxiliary items to details indicated on shop drawings.

2.11.5.6 Cast in anchors, blocking and inserts supplied by other work attached to precast concrete items, as required to accommodate their work.

2.11.5.7 Permanently attach anchors and inserts to the reinforcing, where possible.

2.11.5.8 Lift hooks shall be adequately sized to safely handle panels according to panel dimension and weight.

2.11.5.9 Anchors and inserts shall be concealed where practical.

2.11.6 Reinforce precast architectural concrete units to resist handling, transportation, and erection stresses.

2.11.7 Mix concrete according to fabricators mix design requirements in this section. After concrete batching, no additional water may be added.

2.11.8 Place face mix to a minimum thickness after consolidation of the greater of 25 mm or 1.5 times the maximum aggregate size, but not less than the minimum reinforcing cover.

2.11.9 Place concrete in a continuous operation to prevent seams or planes of weakness from forming in precast concrete units, and in accordance with PCI MNL 117 for measuring, mixing, transporting, and placing concrete.

2.11.10 Thoroughly consolidate placed concrete by internal and external vibration without dislocating or damaging reinforcement and built-in items, using equipment and procedures complying with PCI MNL 117.

2.11.11 Discard precast architectural concrete units that are warped, cracked, broken, spalled, stained, or otherwise defective unless Consultant accepts repairs.

2.12 FINISH

2.12.1 Colour Factors:

2.12.1.1 Cement Colour: Medium Grey, similar colour to match control sample. Coordinate with Consultant (Architect & Landscape Architect)

2.12.2 Unexposed Surface Finish: Unexposed surfaces of precast architectural concrete units by float finish.

2.13 SOURCE QUALITY CONTROL

2.13.1 An independent inspection and testing company may be appointed by the Owner to verify compliance with the requirements of this Specification Section in accordance with Section 01 45 00 – Quality Control.

2.13.2 Cooperate with Owner’s Inspection Agency to facilitate their work.

2.13.3 Cost for inspection will be paid for directly by the Owner.
3 Execution

3.1 EXAMINATION

3.1.1 Examine substrates and conditions for compliance with requirements for installation tolerances, true and level bearing surfaces, and other conditions affecting performance. Proceed with installation only after unsatisfactory conditions have been corrected.

3.1.2 Do not install precast concrete units until supporting concrete or masonry has attained minimum design compressive strength.

3.2 INSTALLATION

3.2.1 Hand over items to be installed by Section 03 31 00, and coordinate timing with Construction Manager and as follows:

3.2.1.1 Provide items in ample time to meet construction program.
3.2.1.2 Supply layout drawings locating accurately the position of items being installed by other Sections of the work.

3.2.2 Erect precast work in accordance with CSA A23.4, and as follows:

3.2.2.1 Set precast concrete units, straight, level and square.

3.2.2.2 Non-cumulative Erection Tolerances:

3.2.2.2.1 Joint Dimension: Maximum 15 mm.
3.2.2.2.2 Joint Taper: Unit edges at joint not out of parallel greater than 0.6 mm in 300 mm, with cumulative total not greater than 3 mm total
3.2.2.2.3 Edge Alignment: Alignment of panel edges not greater than 6 mm
3.2.2.2.4 Offset in faces of adjacent panels not greater than 3 mm.
3.2.2.2.5 Radius Joint Edges: Maximum 5 mm
3.2.2.2.6 Bowed Panels: Within allowable bowing tolerances, arranged so offset between adjacent panels does not exceed 6 mm

3.2.2.3 Fasten units in place by welding wherever possible. Protect work from damage by weld splatter.

3.2.2.4 Provide temporary erection anchorage for welded anchorage system.

3.2.2.5 Tighten with equal torque; secure bolts with lock washers or tack weld nut to bolt, where bolts are used for installation.

3.2.2.6 Clean site welds with wire brush and touch up with steel primer or zinc rich primer to match steel finish materials.

3.2.2.7 Remove shims and spacers from joints between non-load bearing panels after fastening but before sealant is applied.

3.2.2.8 Provide and install sufficient temporary bracing to brace precast concrete units adequately, at all stages of construction, so that units will safely withstand loads to which they may be subjected; keep temporary bracing in position until all connections have been completed.

3.2.2.9 Apply joint sealant and backing to exterior and interior joints to provide a complete weather tight installation in accordance with Section 07 92 00; vent exterior joints. Custom colour selected by Consultant (Architect).

3.2.2.10 Apply anti-graffiti coating sealant in accordance with manufacturer’s written instructions and as follows:

3.2.2.10.1 Cure concrete and concrete repairs a minimum of 28 days.
3.2.2.10.2 Apply solution in a three coat application using approved spray equipment at rate in accordance with manufacturer’s written instructions.
3.2.2.10.3 Protect nonporous surfaces from overspray.

3.3 REPAIRS

3.3.1 Repair exposed exterior surfaces of precast architectural concrete units to match colour, texture, and uniformity of surrounding precast architectural concrete if permitted by Consultant.

3.3.2 Remove and replace damaged precast architectural concrete units if repairs do not comply with requirements.

3.4 CLEANING

3.4.1 Clean exposed surfaces of precast concrete units after erection to remove weld marks, other markings, dirt, and stains:

3.4.1.1 Wash and rinse according to precast concrete fabricator's written recommendations. Protect other work from staining or damage due to cleaning operations.

3.4.1.2 Do not use cleaning materials or processes that could change the appearance of exposed concrete finishes.

3.5 ANTI-GRAFFITI COATING

3.5.1 Apply anti-graffiti coating in accordance with Section 09 96 23, in accordance with manufacturer's written instructions and as follows:

3.5.1.1 Cure concrete and concrete repairs a minimum of 28 days.

3.5.1.2 Apply solution in a three coat application using approved spray equipment at rate in accordance with manufacturer's written instructions.

3.5.1.2.1 Protect nonporous surfaces from overspray.

END OF SECTION
1 General

1.1 SUMMARY

1.1.1 This Section includes general provisions and common work results applicable to
work relating to the fabrication and erection of structural steel, steel joists, light
weight steel framing, wind load bearing steel stud framing and metal
fabrications, and ornamental metals having structural requirements.

1.2 RELATED REQUIREMENTS

1.2.1 Section 01 33 50 – Delegated Design Submittals: Submission requirements for
systems requiring professional design services or certifications by a design
professional employed by the fabricator, and who is not the Consultant.

1.2.2 Section 01 45 00 – Quality Control: Independent testing agency procedures and
administrative requirements relating to quality control.

1.2.3 Section 04 81 00 – Unit Masonry Assemblies: Installation of steel supports and
anchors in masonry assemblies.

1.2.4 Section 05 05 19 – Common Work Results for Metalwork Finishing: Priming
applied to structural steel components and required level of finish for
architecturally exposed structural steel and welds.

1.2.5 Section 05 12 00 – Structural Steel

1.2.6 Section 05 31 10 – Steel Deck

1.2.7 Section 05 41 13 – Wind Load Bearing Steel Stud Framing

1.2.8 Section 05 50 13 – Exterior Metal Fabrications: Design of steel stairs, landings
and handrails, and other load supporting elements.

1.2.9 Section 05 70 00 – Decorative Metal Fabrications: Design of steel stairs, landings
and handrails, and other decorative load supporting elements.

1.3 REFERENCE STANDARDS

1.3.1 Canadian Standards Association (CSA):

1.3.1.1 CSA G40.20-13/G40.21-13, General Requirements for Rolled or
Welded Structural Quality Steel Structural Quality Steel

1.3.1.2 CSA S16-09, Design of Steel Structures

1.3.1.3 CSA S136-12, North American Specification for the Design of Cold-
Formed Steel Structural Members and Commentary

1.3.1.4 CSA W47.1-09, Certification of Companies for Fusion Welding of Steel

1.3.1.5 CSA W48-06, Filler Metals and Allied Materials for Metal Arc Welding

1.3.1.6 CSA W55.3-08, Certification of Companies for Resistance Welding of
Steel and Aluminum

1.3.1.7 CSA W59-03 (R2008), Welded Steel Construction (Metal Arc Welding)

1.3.1.8 CSA W178.1-08, Certification of Welding Inspection Organizations

1.3.1.9 CSA W178.2-08, Certification of Welding Inspectors

1.3.2 Canadian Institute of Steel Construction (CISC):

1.3.2.1 1995, Fundamentals of Structural Shop Drafting (Fifth Edition)

1.3.2.2 2008, CISC Code of Standard Practice (Seventh Edition)

1.3.2.3 May 2010, Handbook of Steel Construction (Tenth Edition)

1.3.3 Canadian Welding Bureau (CWB Group Industry Services):

1.3.3.1 CWB 112E/04-1, Welding Symbols Study Guide

1.3.3.2 CWB 113E/07-1, Weld Quality and Examination Methods Study Guide
1.4 DEFINITIONS

1.4.1 Quality Audit: Tests, inspections, procedures and related actions performed by the Owner during and after execution of the Work using third party testing agency to establish that work complies with Contract Documents and are additional to the Quality Control and Assurance provided by the Construction Manager, or contract administration and reporting performed by Consultant.

1.4.2 Quality Control: Tests, inspections, procedures, and related actions during and after execution of the Work by a third party testing agency to evaluate that completed construction complies with requirements whose services do not include contract enforcement activities performed by Consultant.

1.4.3 Quality Assurance: Activities, actions, and procedures performed before and during execution of the Work by the Construction Manager and Trade Contractor to guard against defects and deficiencies and ensure proposed construction complies with requirements.

1.4.4 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.

1.4.5 Letters of Commitment and Compliance: Documents prepared by the delegated design professional engineer as recommended by APEGA's Responsibilities for Engineering Services for Building Projects.

1.5 ADMINISTRATIVE REQUIREMENTS

1.5.1 Coordination: Coordinate shop priming and finishing requirements with Section 05 05 19.

1.5.2 Testing and Inspections: Owner will appoint and pay for services of testing agency to perform testing and inspection of work of this Section:

1.5.2.1 Notify Consultant prior to commencement of fabrication work so testing and inspection may be properly scheduled and reviewed.

1.5.2.2 Owner may request additional testing and inspection at Trade Contractor's expense when defects are identified.

1.5.2.3 Correct, or remove and replace structural steel with defects revealed by testing and inspection to the recommendations of the testing authority and to the approval of authorities having jurisdiction.

1.5.3 Sequencing: Sequence steel work to account for the following:

1.5.3.1 Supply anchorage items embedded in or attached to other construction without delaying the Work

1.5.3.2 Deliver steel bearing plates and other devices built into concrete and masonry construction so as not to cause delay to the project

1.5.3.3 Schedule delivery of structural steel to Project site in quantities and at times to maintain continuity of installation

1.5.3.4 Schedule delivery of steel joists to Project site in quantities and at times to maintain continuity of installation

1.5.4 Delegated Design Requirements: Design structural steel connections required by the Contract Documents to withstand design loadings indicated and in accordance with requirements of the Building Code and CAN/CSA S16 to resist forces, moments, shears and allow for movements indicated:

1.5.4.1 Engage fabricator who utilizes registered professional engineer to prepare calculations, shop drawings, and other structural data for steel joists and connections not shown on drawings that comply with requirements of this Section.
1.5.4.2 Retain registered professional engineer to ascertain and report fabrication and erection of work meets specific design criteria for materials referenced by Related Requirements, 1.2 above.

1.5.5 Design Coordination: Coordinate ECP requirements for work of this Section in accordance with Section 01 31 26 – Electronic Communications Protocol for BIM and verify CAD, Modelling and Database software packages and other communication requirements as follows:

1.5.5.1 Consultant has prepared drawings that include 3D BIM using Revit software that may be helpful to steel fabricators using compatible 3D Manufacturing Model (3DMM) software; arrange a meeting in accordance with Section 01 31 19 – Project Meetings attended by the Construction Manager, steel Trade Contractor, Consultant and other affected personnel to coordinate compatible information sharing requirements.

1.6 SUBMITTALS

1.6.1 Provide required information in accordance with Section 01 33 00 – Submittal Procedures.

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

1.6.2.1 Product Data: Submit following product test reports for steel deck materials, from qualified testing agency indicating each of following complies with requirements, based on comprehensive testing of current products:

1.6.2.1.1 Provide product certificates signed by steel deck manufacturers certifying products provided comply with requirements of specifications and Building Code.

1.6.2.1.2 Provide product data for mechanical and adhesive fasteners indicating load ratings and methods of installation.

1.6.2.1.3 Provide product data for each type of product specified.

1.6.2.1.4 Provide product data for each type of coating and primer product that will receive subsequent architectural coatings.

1.6.3 Informational Submittals: Provide the following submittals during the course of the work:

1.6.3.1 Certificates: Submit two (2) certified copies of mill reports covering chemical and mechanical properties, and coating designation of steel used for this project.

1.6.3.2 Welder Qualifications: Submit evidence of welder qualifications specified in this Section.

1.6.3.3 Quality Management Plan: Written documents provided by the Construction Manager indicating quality assurance and activities undertaken by the Trade Contractor including; but not limited to, the following:

1.6.3.3.1 Schedule of Tests and Inspections: Submit schedule of tests and inspections performed by the Trade Contractor; prepared in tabular form and including the following:

- Specification section number and title
- Description of test and inspection
- Identification of applicable standards
- Identification of test and inspection methods
- Number of tests and inspections required
- Time schedule or time span for tests and inspections
- Entity responsible for performing tests and inspections
• Requirements for obtaining samples
• Unique characteristics of each quality assurance service

1.6.3.3.2 Reports: Submit written reports prepared by Construction Manager’s inspection agency that includes the following:
• Date of issue
• Project title and number
• Name, address, and telephone number of testing agency
• Dates and locations of samples and tests or inspections
• Names of individuals making tests and inspections
• Description of the Work and test and inspection method
• Identification of product and specification section
• Complete test or inspection data
• Test and inspection results and an interpretation of test results
• Ambient conditions at time of sample taking and testing and inspecting
• Comments or professional opinion on whether tested or inspected Work complies with the Contract Document requirements
• Name and signature of laboratory inspector
• Recommendations on re-testing and re-inspecting

1.6.3.4 Delegated Design Submittals: Submit Letters of Commitment and Compliance in accordance with Section 01 33 50 – Delegated Design Submittals, and as follows:

1.6.3.4.1 At the onset of work of this section and prior to shop drawing submission, prepare and submit a Letters of Commitmen], including a summary of the work covered by this section.

1.6.3.4.2 On completion of work of this section, prepare and submit a Letters of Compliance, including a summary of the work covered by this section.

1.6.3.4.3 Letters referred to in 1.6.3.4.1 and 1.6.3.4.2 above must cover all aspects of structural steel, steel joist, steel deck work and structural steel stairs including; but not limited to, design of connections and erection.

1.6.3.5 Source Quality Control Submittals: Submit following mill test reports signed by manufacturers certifying their products comply with following requirements when requested by the Consultant:

1.6.3.5.1 Structural steel, including chemical and physical properties
1.6.3.5.2 Bolts, nuts, and washers, including mechanical properties and chemical analysis
1.6.3.5.3 Direct tension indicators
1.6.3.5.4 Headed stud shear connectors
1.6.3.5.5 Twist-off tension control bolts or other alternative design bolts

1.6.4 Sustainable Design Submittals: Coordinate project sustainable design requirements with Section 01 35 31 - LEED Special Project Procedures and Section 01 35 31A - LEED Material Information Sheet for LEED Submittals.

1.7 QUALITY ASSURANCE

1.7.1 Regulatory Requirements: Provide design, materials and fabrication in accordance with CSA S16, CSA S136 and Canadian Welding Bureau certification requirements including the following:

1.7.1.1 Fabricator certified by CWB to CSA W47.1, Division 1 or 2.1.
1.7.1.2 Perform welding inspection in accordance with CSA W178.1 and CSA W178.2.
1.7.1.3 Perform resistance welding in accordance with CSA W55.3.
1.7.1.4 Perform fusion welding in accordance with CSA W59.
1.7.1.5 Fabricator will only be permitted to subcontract or sublet work of fabrication or installation to another CWB certified company.
1.7.1.6 Installer must be CWB certified where they are directly subcontracted by the Trade Contractor to same requirements as fabricator.

1.7.2 Qualifications: Provide proof of qualifications when requested by Consultant:

1.7.2.1 Retain Delegated Design Professional Engineer to design fabrication and erection of the Work of this Section in accordance with applicable Building Code and Contract Documents requirements including the following:
   1.7.2.1.1 Seal and signature to fabrication and erection documents and design submittals
   1.7.2.1.2 Site review of installed components
   1.7.2.1.3 Completion of Letters or Commitment and Compliance specified in Section 01 33 50

1.7.2.2 Fabricator: Use fabricator experienced in fabricating structural steel similar to that indicated for this Project and with record of successful in service performance, and sufficient production capacity to fabricate structural steel without delaying the Work.

1.7.2.3 Installers: Use installers; if different than fabricator, experienced with structural steel work similar in material, design, and extent to that indicated for this Project; with record of successful in service performance; using welders certified by CWB for classification of work being performed; and having same certifications as required by CSA and CWB for fabricator.

1.7.3 Certifications: Provide proof of the following during the course of the Work:

1.7.3.1 Welding Certificates: Comply with applicable CWB standards for classification of work being performed including following:
   1.7.3.1.1 Welding inspection: to CSA W178.
   1.7.3.1.2 Resistance welding: to CSA W55.3.
   1.7.3.1.3 Fusion welding: to CSA W59.

1.7.3.2 Failure of fabricator and installer to maintain CSA and CWB requirements for certification will result in having their certification withdrawn in accordance with the contract that they sign with CSA and CWB, and considered as being in breach of Contract for the Work of the Project leading to decertification.

1.7.4 Quality Management Plan: Provide inspections, testing and reports during the course of the work confirming that the work of steel fabrication and erection is conducted in accordance with the Contract Documents; the frequency of testing and inspection by the Owner’s inspection and testing agency may be adjusted in consultation with the Owner, Construction Manager and Consultant where the steel Trade Contractor’s own Quality Management Plan demonstrates its effectiveness during the course of the project.

1.8 DELIVERY, STORAGE, AND HANDLING

1.8.1 Storage and Handling Requirements: Store materials to permit easy access for inspection and identification; keep steel members off ground by using pallets, platforms, or other supports; protect steel members and packaged materials from erosion and deterioration, and as follows:

1.8.1.1 Store fasteners in a protected place
1.8.1.2 Clean and re-lubricate bolts and nuts that become dry or rusty before using
1.8.1.3 Do not store materials on structure in manner that might cause distortion or damage to members or supporting structures
1.8.1.4 Repair or replace damaged materials or structures as directed

2  Products

2.1  SUBSTITUTIONS

2.1.1 Use of structural steel sections other than those shown on the Drawings or listed in the Specifications will require a formal contract change unless written approval was obtained from the Consultant by the fabricator before bid submission.

2.1.2 Similar products may be incorporated into the work of this Section provided they meet the performance requirements established by sections and profiles indicated on the drawings provided requests for substitution are submitted in accordance with Section 01 25 00 – Substitution Procedures.

2.2  MATERIALS

2.2.1 Welding Materials: Meeting requirements of CSA W48 and certified by CWB for intended use and materials.

2.3  FABRICATION

2.3.1 Shop Welding: Weld corners and seams continuously and as follows:

   2.3.1.1 Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals
   2.3.1.2 Obtain fusion without undercut or overlap
   2.3.1.3 Remove welding flux immediately
   2.3.1.4 At exposed connections, finish exposed welds and surfaces smooth and blended so no roughness shows after finishing and contour of welded surface matches that of adjacent surface

2.4  SOURCE QUALITY CONTROL

2.4.1 Inspection and Testing: Owner’s obligation to inspection and testing, which are additional to the Trade Contractor’s requirements under the Quality Management Plan for maintaining quality assurance.

3  Execution

3.1  EXAMINATION

3.1.1 Report any discrepancy and potential problem areas to Consultant for direction before commencing fabrication or erection.

3.1.2 Do not proceed with erection until unsatisfactory conditions have been corrected.

3.2  PREPARATION

3.2.1 Provide temporary shores, guys, braces, and other supports during erection to keep structural steel secure, plumb, and in alignment against temporary construction loads and loads equal in intensity to design loads.

3.2.2 Verify that site safety measures are in place and personal protection equipment is worn in accordance with General Conditions of Contract before starting any work of this Section.

3.3  CONNECTION TO EXISTING WORK

3.3.1 Verify dimensions and condition of existing work; report any discrepancies and potential problem areas to the Consultant before commencing with fabrication.

3.4  ERECTION

3.4.1 Erect structural steel in accordance with CAN/CSA S16 and CSA S136.
3.4.2 Obtain Consultant’s review before site cutting or altering any members.

3.4.3 Set structural steel accurately in locations and to elevations indicated on Drawings and reviewed shop drawings.

3.4.4 Site Welding: Perform welding work in accordance with CSA W59; do not weld, cut or abrade surfaces of exterior units that have been hot dip galvanized after fabrication and are for bolted or screwed site connections and as follows:

3.4.4.1 Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.

3.4.4.2 Obtain fusion without undercut or overlap.

3.4.4.3 Remove welding flux immediately.

3.4.4.4 At exposed connections, finish exposed welds and surfaces smooth and blended so no roughness shows after finishing and contour of welded surface matches that of adjacent surface.

3.5 SITE QUALITY CONTROL

3.5.1 Inspection and Testing: Owner’s obligation to inspection and testing, which are additional to the Trade Contractor’s requirements under the Quality Management Plan for maintaining quality assurance.

END OF SECTION
1 General

1.1 SUMMARY

1.1.1 This Section includes requirements regarding the appearance and surface preparation for non-exposed, exposed and architecturally exposed priming, and finishing of the following metal items and assemblies:

1.1.1.1 Structural steel framing
1.1.1.2 Steel deck
1.1.1.3 Metal fabrications

1.1.2 Architecturally exposed structural steel welds require a higher degree of workmanship and finishing than standard exposed structural steel or metal fabrication components.

1.1.3 Architecturally exposed structural steel is identified on the Structural and Architectural Drawings as AESS1, AESS2, AESS3 or AESS4 depending on the level of finish identified in this Section; definitions for AESS applies equally to structural steel, and metal fabrications, and to locations as follows:

1.1.3.1 Trusses 1, 1A, 2, 3, 4, and 5 all diagonal members
1.1.3.2 Skylight framing
1.1.3.3 All diagonal web members between Level Marker (-50 mm) and the underside of cast concrete girders (+50 mm).
1.1.3.4 AESS 3 not required between Level Marker & U/S of girder

1.1.4 Architecturally exposed structural steel specifications and guidelines listed in this Section are based on recommended practices and procedures prepared by the Canadian Institute of Steel Construction (CISC).

1.2 RELATED REQUIREMENTS

1.2.1 Section 05 05 00 – Common Work Results for Metals: LEED requirements for submissions and use of low or no VOC containing materials.
1.2.2 Section 05 12 00 – Structural Steel: Priming and finishing steel framing.
1.2.3 Section 05 31 10 – Steel Deck: Site installation of shear connectors, requirements relating to exposed steel decking and its connections, fastener spacing and weld show through in areas where decking is visible in the finished structure and coordination of paint system requirements.
1.2.4 Section 05 50 13 – Exterior Metal Fabrications: Loose steel bearing plates and miscellaneous steel framing and assemblies.
1.2.5 Section 05 51 00 – Steel Stairs and Ladders
1.2.6 Section 07 81 23 - Intumescent Fireproofing
1.2.7 Section 09 91 00 - Painting

1.3 DEFINITIONS

1.3.1 Non-Exposed Standard Structural Steel: Structural steel that is concealed in final construction; that is not subject to weathering or aggressive conditions; and that does not require special coatings to prevent corrosion.

1.3.2 Exposed Standard Structural Steel: Structural steel that is exposed to view or concealed in final construction and is subject to weathering or aggressive conditions that require additional protection to prevent corrosion and loss of sectional area.
1.3.3 Architecturally Exposed Structural Steel: The following finish levels for architecturally exposed structural steel as defined by CISC Code of Standard Practice, Table 1 are required by this specification, and apply to all forms of steel structures and metal fabrications identified:

1.3.3.1 AESS1 Basic Elements: Not Used
1.3.3.2 AESS2 Feature Elements Viewed at a Distance greater than 6 metres: Not Used
1.3.3.3 AESS3 Feature Elements Viewed at Distance 6 metres and less: Steel structure requiring enhanced workmanship as listed above for AESS1 and AESS2 having mill marks removed, butt and plug welds ground smooth and filled, cross sectional abutting surfaces aligned, and joint gap tolerances minimized and all connections welded.

1.3.3.4 AESS4 Showcase Elements: Not Used
1.3.3.5 AESSC Custom Elements: Not Used

1.4 REFERENCE STANDARDS

1.4.1 American Society for Testing and Materials (ASTM):

1.4.1.1 ASTM A123/A123M-13, Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products
1.4.1.2 ASTM A780-01 (2006), Standard Practice for Repair of Damaged and Uncoated Areas of Hot-Dip Galvanized Coatings

1.4.2 Canadian General Standards Board (CGSB):

1.4.2.1 CAN/CGSB-1.181, Single Component Organic Zinc Rich Primer

1.4.3 Canadian Standards Association (CSA):

1.4.3.1 CSA W47.1-92 (R1998), Certification of Companies for Welding of Steel Structures
1.4.3.2 CSA W48-01, Filler Metals and Allied Materials for Metal Arc Welding
1.4.3.3 CSA W55.3-1965 (R1998), Resistance Welding Qualification Code for Fabricators of Structural Members Used in Buildings
1.4.3.4 CSA W59-M1989 (R1998), Welded Steel Construction (Metal Arc Welding)
1.4.3.5 CSA W178.2-1996, Certification of Welding Inspectors

1.4.4 Canadian Welding Bureau (CWB Group Industry Services):

1.4.4.1 CWB 113E, 94-1, Weld Quality and Examination Methods Study Guide

1.4.5 Canadian Institute of Steel Construction (CISC):

1.4.5.1 CISC/CPMA Standard 2-75, A Quick-drying Primer For Use On Structural Steel
1.4.5.3 CISC Code of Standard Practice, Appendix 1, Architecturally Exposed Structural Steel (AESS)

1.4.6 The Society for Protective Coatings (SSPC)/National Association of Corrosion Engineers (NACE International):

1.4.6.1 Coating Materials Guidelines
1.4.6.2 Surface Preparation Guidelines:
   1.4.6.2.1 SSPC-SP3, Power Tool Cleaning
   1.4.6.2.2 SSPC-SP6/NACE No. 3, Commercial Blast Cleaning

1.4.7 Master Painter’s Institute (MPI):

1.4.7.1 Architectural Painting Specification Manual
1.4.8 The National Association of Architectural Metal Manufacturers (NAAMM):
  1.4.8.1 AMP 505-88, Applied Coatings
  1.4.8.2 AMP 550-89, Metal Product Outline
  1.4.8.3 AMP 555-92, Code of Standard Practice for Architectural Metal Industry, including Miscellaneous Iron

1.5 ADMINISTRATIVE REQUIREMENTS

1.5.1 Pre-Installation Conference: Conduct a pre-installation conference at Project site in accordance with requirements of Section 01 31 19 – Project Meetings before starting any work of this Section to review requirements for finishing architecturally exposed structural steel:
  1.5.1.1 Agenda for pre-installation conference will include, but not be limited to coordinate requirements for shipping, special handling, attachment of safety cables and temporary erection bracing, touch up painting, fabrication and erection procedures, and other requirements affecting metalwork finishing for the project.
  1.5.1.2 Review of requirements of finishing requirements for architecturally exposed steel.
  1.5.1.3 Coordination with affected Division 05 and 09 Sections.

1.5.2 Coordination: Coordinate coating requirements with affected Division 05 Sections with requirements specified for Section 09 91 00; establish responsibilities, pre-coating requirements and site finishing requirements.
  1.5.2.1 The use of bulk shop primers and temporary coatings for all exterior and interior architecturally exposed structural steel work will not be permitted unless it forms a part of a painting system specified in Section 09 91 00.
  1.5.2.2 Where non-complying primers are used, this section of work shall completely remove deficient primer from surfaces, and prepare and prime surfaces in accordance with the requirements of Section 09 91 00 for painted steel work at no additional cost to the Consultant or Owner.
  1.5.2.3 Coordinate compatible shop primer for architecturally exposed structural steel with Section 09 91 00 as follows:
    1.5.2.3.1 This section will be responsible for surface preparation and application of compatible primer systems.
    1.5.2.3.2 Structural steel and metal fabrications fabricator may use painting contractor for application of primer provided that Bid Price is coordinated through Construction Manager.
    1.5.2.3.3 Metal fabricators will be responsible for applying primer to match shop applied materials at site welds, immediately after completion of welds.
    1.5.2.3.4 Section 09 91 00 will perform minor site touch-up and repair to priming system, and apply finish coats of paint.
    1.5.2.3.5 This method of finishing has been specified to minimize primer and finish coating incompatibility, and to satisfy primer “open-time” limits for proper application of finish coats.
    1.5.2.3.6 The primers specified are intended to form a part of a total system and shall be compatible with and be produced by the same manufacturer as the finish coats.
1.5.2.4 Coordinate installation of anchors for AESS members that connect to the work of other trades as follows:

1.5.2.4.1 Furnish setting drawings, templates, and directions for installing anchors, including sleeves, concrete inserts, anchor bolts, and items with integral anchors, that are to be embedded in concrete or masonry.

1.5.2.4.2 Deliver such items to the project site in time for installation.

1.6 SUBMITTALS

1.6.1 Provide requested information in accordance with Section 01 33 00 – Submittal Procedures.

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

1.6.2.1 Product Data: Submit product data for each type of coating products and primers that will receive subsequent architectural coatings indicating:

1.6.2.1.1 Submit components and application procedures of the paint system as a single coordinated submittal and indicate compatibility and maximum recoat times for each product.

1.6.2.1.2 Identify required surface preparation, primer, intermediate coat (if applicable) and finish coat.

1.6.2.1.3 Coordinate submittal information with finish coat specified in Section 09 91 00.

1.6.2.2 Shop Drawings: Submit shop drawings detailing fabrication of AESS components, as follows:

1.6.2.2.1 Provide erection drawings clearly indicating which members are considered as AESS members.

1.6.2.2.2 Include details that clearly identify requirements listed in for Fabrication and Erection; provide connections for exposed AESS consistent with concepts shown on the architectural or structural drawings.

1.6.2.2.3 Indicate welds by standard CWB symbols, distinguishing between shop and site welds, and show size, length and type of each weld; identify grinding, finish and profile of welds as defined in this Section.

1.6.2.2.4 Indicate type, size, finish and length of bolts, distinguishing between shop and site bolts; identify high strength bolted slip critical, direct tensioned shear/bearing connections; indicate which direction bolt heads should be oriented in final assembly.

1.6.2.2.5 Clearly indicate which surfaces or edges are exposed and class of surface preparation.

1.6.2.2.6 Indicate special tolerances and erection requirements as noted on the drawings or defined herein.

1.6.2.3 Samples: Submit samples indicating welds and finishing techniques prior to starting any architecturally exposed welding and finishing work, as follows:

1.6.2.3.1 Finish samples with primer listed in for use in this Section.

1.6.2.3.2 Prepare samples free of tool marks, foundry identification marks, pits and scale and other defects detrimental to finished appearance.

1.6.2.3.3 Sample will be used by the Consultant to determine acceptability of welds and surface preparation for architecturally exposed structural steel fabrications on site.
1.6.2.3.4 Consultant may request modifications to the submitted sample; fabricator shall make the changes as indicated until acceptance is obtained from the Consultant.

1.6.3 Informational Submittals: Provide the following submittals when requested by the Consultant:

1.6.3.1 Qualification Statement: Submit qualification data for firms and persons fabricating and erecting AESS demonstrating their capabilities and experience when requested by the Consultant; include lists of completed project names and address, names and addresses of consultants and owners, and other information specified; and photographs showing detail of installed AESS in referenced projects.

1.6.3.2 Certification: Submit SSPC certification listing qualifications of finish coating application for finish systems and type of work specified in this Section.

1.6.4 Sustainable Design Submittals: Coordinate project sustainable design requirements with Section 01 35 31 - LEED Special Project Procedures and Section 01 35 31A - LEED Material Information Sheet for LEED Submittals.; in addition, provide information for specific requirements listed in Section 05 05 00.

1.7 QUALITY ASSURANCE

1.7.1 Qualifications: Provide proof of qualifications when requested by Consultant:

1.7.1.1 Fabricator: In addition to qualifications specified in Section 05 05 00, engage a firm experienced in fabricating AESS similar to that indicated for this Project with a record of successful in-service performance, as well as sufficient production capacity to fabricate AESS without delaying the Work.

1.7.1.2 Erector: In addition to qualifications listed in Section 05 05 00, engage an experienced erector who has completed AESS work similar in material, design, and extent to that indicted for this Project and with a record of successful in-service performance.

1.8 MOCK-UPS

1.8.1 Provide required Mock-Ups in accordance with Section 01 45 00 – Quality Control.

1.8.2 Construct mock-ups to demonstrate aesthetic effects as well as qualities of materials and execution at least four (4) weeks prior to fabricating AESS using materials indicated for final Work.

1.8.3 Construct mock-ups of each of the following elements:

1.8.3.1 Locate mock-ups in the location and size as directed by Consultant.
   1.8.3.1.1 Interior Architecturally Exposed Structural Steel

1.8.3.2 Mock-ups shall be full size pieces unless the Consultant specifically accepts smaller models representative of the work.

1.8.3.3 Notify the Consultant one week in advance of the dates and times when mock-ups will be available for review.

1.8.3.4 Demonstrate the proposed range of aesthetic effects regarding each element specified or indicated on the drawings.

1.8.3.5 Construct mock-up with final finished surface including surface preparation and paint system.

1.8.3.6 Obtain Consultant’s acceptance of mock-ups before starting fabrication of final units.

1.8.3.7 Retain and maintain mock-ups during construction in an undisturbed condition as a standard for judging the completed work.
1.8.3.8 Accepted samples in an undisturbed condition at the time of Substantial Performance may become part of the completed work.

1.8.3.9 If the AESS samples do not meet the minimum requirements specified, it may be necessary to fabricate additional samples.

1.9 DELIVERY, STORAGE, AND HANDLING

1.9.1 Delivery and Acceptance Requirements: Use special care in handling to prevent twisting or warping of AESS members:

1.9.1.1 Erect pre-painted finish pieces using padded slings or other methods to protect them from damage arising from handling including, but not limited to, the following:

1.9.1.2 Provide padding as required to protect while rigging and aligning member’s frames.

1.9.1.3 Weld tabs for temporary bracing and safety cabling only at points concealed from view in the completed structure or where approved by the Consultant during the pre-installation meeting.

1.9.1.4 Submit methods of removing temporary erection devices and finishing, and refinishing pre-painted pieces for review and acceptance by the Consultant prior to erection.

1.9.2 Storage and Handling Requirements: Store materials to permit easy access for review and identification; store steel members off ground by using pallets, platforms, or other supports; protect steel members and packaged materials from erosion and deterioration.

2 Products

2.1 METAL MATERIALS

2.1.1 Coordinate requirements of this Section with related requirements of referenced Division 5 – Metals technical specification sections.

2.2 NON-EXPOSED STANDARD STRUCTURAL STEEL

2.2.1 Clean and prepare structural steel surfaces in accordance environmental exposure class as follows:

2.2.1.1 Zone 0: Leave uncoated

2.3 SHOP FINISHING; EXPOSED STANDARD STRUCTURAL STEEL

2.3.1 Clean and prepare exposed structural steel surfaces in accordance with coating manufacturer’s recommended profile and surface specification requirements; where they are more stringent than the minimums listed in this Section, and for the following environmental exposure classes:

2.3.1.1 Zone 0: Leave uncoated

2.3.1.2 Zone 1A: Shop prime using CISC/CPMA 2-75 over minimum SSPC- SP6 ready for site applied single finish coat of alkyd based enamel specified in Section 09 91 00.

2.3.1.3 Zone 1B: Shop prime using CISC/CPMA 2-75 over minimum SSPC- SP6 ready for site applied double finish coat of alkyd based enamel specified in Section 09 91 00

2.3.2 Do not prime exposed structural steel surfaces in the following conditions:

2.3.2.1 Surfaces that are embedded in concrete or mortar; prime partially embedded members to a depth of 50 mm only

2.3.2.2 Surfaces that will be site welded

2.3.2.3 Surfaces that will be high strength bolted with slip critical connections

2.3.2.4 Surfaces that will receive sprayed applied fire resistant material

2.3.2.5 Galvanized surfaces
2.3.3 Apply primer under cover, on dry surfaces only and when surface and air temperatures are at and rising, or above manufacturer’s recommended minimum application temperature; and maintain temperature until primer is thoroughly cured.

2.3.4 Apply primer immediately after surface cleaning and priming in accordance with manufacturer's instructions and dry film thickness recommendations using methods as required to achieve full coverage of the following:
   2.3.4.1 Joints, corners, edges, and exposed surfaces
   2.3.4.2 Corners, crevices, bolts, welds, and sharp edges
   2.3.4.3 Apply second coat of shop primer to surfaces that will be inaccessible after assembly or erection; change colour of second coat.

2.3.5 Refer to Section 09 91 00 for coating and application requirements for application of site applied finishing systems.

2.4 SHOP FINISHING; ARCHITECTURALLY EXPOSED STRUCTURAL STEEL

2.4.1 Clean and prepare architecturally exposed structural steel surfaces in accordance with coating manufacturer’s recommended profile and surface specification requirements; where they are more stringent than the minimums listed in this Section.

2.4.2 Exposure Class: Zone 1A, as defined above for exposed structural steel using the primers systems listed below for AESS.

2.4.3 Finish System for Bare Steel: As indicated in Section 07 81 23 – Intumescent Fireproofing.

2.5 GALVANIZING

2.5.1 Hot Dip Galvanized Finish: Hot dip galvanize in accordance with ASTM A123/A123M to locations indicated; 300 g/m² minimum zinc coating; galvanize components after assembly where size permits.

2.6 SHOP COATINGS

2.6.1 Zinc Rich Paint: Single component organic zinc anticorrosive primer in accordance with CAN/CGSB-1.181 and as follows:
   2.6.1.1 Clean metal to SSPC SP3- Power Tool Cleaning in accordance with surface preparation requirements and environmental exposure limitations listed in CAN/CGSB-1.181
   2.6.1.2 Apply two (2) coats zinc rich paint to all surfaces exposed after assembly to manufacturer’s minimum dry film thickness.
   2.6.1.3 Apply coating immediately after cleaning

2.6.2 Isolation Coating: Acid and alkali resistant asphaltic paint to CAN/CGSB-1.108.
   2.6.2.1 Apply an isolation coating to contact surfaces of following components in contact with cementitious materials and dissimilar metals except stainless steel:
      2.6.2.1.1 Exterior components
      2.6.2.1.2 Interior components exposed to high humidity conditions

2.6.3 Use primer as prepared by manufacturer without thinning or adding admixtures. Paint on dry surfaces, free from rust, scale, grease, do not paint when temperature is below 7°C.

2.6.4 Do not paint surfaces to be site welded. Prime and apply first finish coat after site welding has been completed, immediately prior to applying final finish coat to completed assembly.
2.7  FABRICATION OF ARCHITECTURALLY EXPOSED STRUCTURAL STEEL (AESS)

2.7.1  Fabricate and assemble AESS in the shop to the greatest extent possible in accordance with CISC requirements for Category listed for the project and as follows:

2.7.1.1  Detail AESS assemblies to minimize site handling and expedite erection.
2.7.1.2  Fabricate AESS with exposed surfaces smooth, square and of surface quality consistent with the accepted sample.
2.7.1.3  Use special care in handling and shipping of AESS both before and after shop painting.

2.8  SHOP CONNECTIONS

2.8.1  Bolted Connections: Make in accordance with Section 05 05 00 and 05 12 00

2.8.1.1  Provide bolt type and finish as specified in this section; align bolt heads as indicated on shop and erection drawings.

2.8.2  Welded Connections:

2.8.2.1  Comply with requirements specified in Section 05 05 00 and 05 12 00.
2.8.2.2  Make appearance and quality of welds consistent with mock-up.
2.8.2.3  Assemble and weld built-up sections by methods that maintain alignment of members without warp exceeding tolerances of this section.

3  Execution

3.1  EXAMINATION

3.1.1  Verify exposure of steel components, architectural or non-exposed, and finish assemblies as specified.

3.1.2  Report any discrepancy and potential problem areas to Consultant for direction before commencing finishing operations.

3.2  APPLICATION OF PRIMERS AND COATINGS

3.2.1  Primer: Spray applied at fabrication shop by this Section, touch-up and recoating by Section 09 91 00, and as follows:

3.2.1.1  Work primer into all corners
3.2.1.2  Touch-up bare or worn areas on site after installation
3.2.1.3  Leave surfaces unpainted as follows:

3.2.1.3.1  Surfaces that are embedded in concrete or mortar; prime partially embedded members to a depth of 50 mm only.
3.2.1.3.2  Surfaces that will be site welded.
3.2.1.3.3  Surfaces that will be high strength bolted with slip critical connections.
3.2.1.3.4  Surfaces that will receive sprayed applied fire resistant material.

3.2.1.4  Confirm VOC limits are within LEED tolerances.

3.2.2  Field touch-up and repair shop primer and galvanized finishes at bolts, welds and burned or scratched surfaces using same primer as applied in shop and coat with zinc paint in accordance with ASTM 780.

3.3  INSTALLATION OF ARCHITECTURALLY EXPOSED STRUCTURAL STEEL (AESS)

3.3.1  Install AESS accurately in locations and to elevations indicated in accordance with CISC requirements for Category listed for the project and as follows:

3.3.2  Bolted Connections: Install bolts of specified type and finish in accordance with Section 05 12 00 and as follows:
3.3.2.1 Bolt Head Alignment is indicated on Drawings: Orient bolt heads for each connection as indicated on erection drawings and verify orientation on site.

3.3.2.2 Bolt Head Alignment is not indicated on Drawings; Orient bolt heads for each connection to one side acceptable to the Consultant.

3.3.3 Welded Connections: Comply with CWB procedures for appearance; refer to Section 05 05 00 and 05 12 00 for other requirements, and as follows:

3.3.3.1 Assemble and weld built-up sections by methods that will maintain true alignment of axes without warp.

3.3.3.2 Verify that weld sizes, fabrication sequence, and equipment used for AESS will limit distortions to allowable tolerances.

3.3.3.3 Obtain Consultant’s acceptance for appearance of welds in repaired or site modified work.

3.3.3.4 Make site welded profiles, quality, and finish consistent with mock-ups accepted prior to fabrication.

3.3.3.5 Splice members only where indicated, or where found acceptable by the Consultant.

3.3.3.6 Obtain permission for any torch cutting or site fabrication from the Consultant; finish sections thermally cut during erection to a surface appearance consistent with the mock up.

3.3.3.7 Do not enlarge unfair holes in members by burning or by using drift pins; ream holes that must be enlarged to admit bolts; replace connection plates that are misaligned where holes cannot be aligned with acceptable final appearance.

3.3.4 Site Quality Control: Perform testing and inspections in accordance with Section 05 05 00 to verify structural requirements for detailed bolt and weld connections.

3.3.5 Acceptance of AESS Appearance: Consultant will observe AESS in place and determine acceptability based on mock-up and samples; repair, or remove and replace materials not meeting standard of workmanship up at no additional cost to the Owner or Consultant.

3.4 ADJUSTING AND CLEANING

3.4.1 Site Touch-Up and Repair Shop Primer and Galvanized Finishes:

3.4.1.1 Touch-Up Painting: Cleaning and touch-up painting of site welds, bolted connections, and abraded areas of shop paint shall completed to blend with the adjacent surfaces in accordance with manufacturer’s instructions as specified in Section 09 91 00.

3.4.1.2 Galvanized Surfaces: Clean site welds, bolted connections, and abraded areas and repair galvanizing in accordance with ASTM A780.

END OF SECTION
1 GENERAL

1.1 WORK INCLUDED

1.1.1 Section 01 31 19 - Project Meetings
1.1.2 Section 01 33 00 – Submittal Procedures
1.1.3 Section 01 33 50 - Delegated Design Submittals
1.1.4 Section 01 35 31 - LEED Special Project Procedures
1.1.5 Provide all labour, materials, plant and equipment to complete the structural steel work indicated on the drawings and specified herein.

1.1.6 It is the Trade Contractor’s responsibility to verify the availability of the steel sections shown on the structural drawings at time of tender, and to immediately notify the Consultant if any of the sections are not readily available and need to be substituted. Substitutions made after tender will be at the expense of the Trade Contractor.

1.1.7 It is the Trade Contractor’s responsibility to verify that sections which are shown to be curved or cranked, can be fabricated as shown without any reduction in the load carrying capacity of the member. If curved or cranked members cannot be fabricated as shown, the Trade Contractor is to identify, at the time of tender, which sections cannot be fabricated, and to propose alternative sections for consideration by the Consultant. Any cost associated with any alternations to such members identified after tender will be at the expense of the Trade Contractor.

1.2 RELATED WORK SPECIFIED ELSEWHERE

1.2.1 Bearing assemblies Concrete Forming and Accessories, Section 03 10 00
1.2.2 Concrete Reinforcement, Section 03 20 00.
1.2.3 Grouting beneath column bases and bearing assemblies on concrete members, Section 03 30 00.
1.2.4 Cast-in-Place Concrete, Section 03 30 00.
1.2.5 Common Work Results for Metalwork Finishing, Section 05 05 19
1.2.6 Reinforcement of edges of openings in steel deck that are not larger than 450 mm (18") in roof deck and 300 mm (12") in floor deck, Section 05 31 00.
1.2.7 Painting, Section 09 91 00.
1.2.8 Applied Fireproofing, Section 07 81 00.
1.2.9 Intumescent Fireproofing, Section 07 81 23.

1.3 REFERENCE STANDARDS, CODES AND ACTS

1.3.1 Conform to the Alberta Building Code 2006 (The Building Code) as amended by all subsequent Alberta Regulations issued to the date of this specification] and applicable acts of authorities having jurisdiction.
1.3.1.1  ASTM A325M-14 - Structural Bolts, Steel, Heat Treated 830 MPa Minimum Tensile Strength

1.3.1.2  ASTM A490M-14a - High-Strength Steel Bolts, Classes 10.9 and 10.9.3, for Structural Steel Joints (Metric)

1.3.1.3  ASTM A6/A6M-14 - General Requirements for Rolled Structural Steel Bars, Plates, Shapes, and Sheet Piling.

1.3.1.4  ASTM A108-13 - Standard Specification for Steel Bar, Carbon and Alloy, Cold-Finished

1.3.1.5  ASTM A500/A500M-13 - Standard Specification for Cold Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes.


1.3.1.7  ASTM A992/A992M-11- Standard Specification for Steel for Structural Steel Shapes


1.3.1.10  ASTM F1554-07ae1- Standard Specification for Anchor Bolts, Steel 36, 55 and 105 ksi Yield Strength

1.3.1.11  ASTM F1852-14 - Standard Specification for “Twist Off” Type Tension Control Structural Bolt/Nut/Washer Assemblies, Steel, Heat Treated, 120/105 ksi Minimum Tensile Strength

1.3.1.12  ASTM F2280-14 - Standard Specification for “Twist Off” Type Tension Control Structural Bolt/Nut/Washer Assemblies, Steel, Heat Treated, 150 ksi Minimum Tensile Strength

1.3.1.13  ASTM F959-13 - Standard Specification for Compressible-Washer- Type Direct Tension Indicators for Use with Structural Fasteners

1.3.1.14  ASTM F436-11 - Standard Specification for Hardened Steel Washers

1.3.1.15  AWS D1.1/D1.1M-2010 - Structural Welding Code – Steel.

1.3.1.16  AWS A2/1-DC-2007 - Welding Symbol Chart

1.3.1.17  CAN/CSA G40.20-04/ - General Requirements for Rolled or Welded

1.3.1.18  G40.21-04 (R2009)Structural Quality Steel/Structural Quality Steel

1.3.1.19  CAN/CSA G164-M92 (R2003) - Hot Dip Galvanizing of Irregularly Shaped Articles

1.3.1.20  CSA-S16-09 - Design of Steel Structures
1.3.1.21 CSA-W47.1-09 - Certification of Companies for Fusion Welding of Steel Structures
1.3.1.22 CSA-W48-06 - Filler Metals and Allied Materials for Metal Arc Welding
1.3.1.23 CSA-W55.3-08 - Certification of Companies for Resistance Welding of Steel and Aluminum
1.3.1.24 CSA-W59-03 (R2008) - Welded Steel Construction (Metal Arc Welding)
1.3.1.25 ISO 9002-94 - Model for Quality Assurance in Production and Installation
1.3.1.26 SSPC (The Society for Protective Coatings) (formerly SSPC – Steel Structures Painting Council) Steel Structures Painting Manual
1.3.1.27 CISC Guide for Specifying Architecturally Exposed Structural Steel, latest edition
1.3.1.32 American Institute of Steel Construction (AISC) supplements to the “Specification for Structural Steel for Buildings,” latest edition.

1.3.2 Where there are differences between the specifications and the drawings and the standards, codes or acts, the most stringent shall govern.

1.3.3 Standards and publications referenced by the Standards noted above are to apply even if they are not included in the list. Where such reference is made, it shall be to the latest edition and revision published.

1.4 CISC CODE OF STANDARD PRACTICE FOR STRUCTURAL STEEL

1.4.1.1 The CISC’s Code of Standard Practice for Structural Steel shall govern the work, subject to the modifications noted below.

1.4.1.2 Revise Clause 1.4 Responsibility for Design as follows:

1.4 Responsibility for Design. When the client provides the structural drawings and specifications, the fabricator and the erector shall not be responsible for determining the adequacy of the design nor liable for the loss or damage resulting from an inadequate design. The Engineer of Record shall be responsible for the sizing of steel members and their supports as required by the Building Code and the provision of connection forces indicated on the structural drawings. The fabricator's engineer shall be responsible for the design and detailing of all connections and components, members and assemblies standardized by the fabricator. (See also Clause 5.6.)
1.4.1.3 Add the following to Clause 1.5, Responsibility for Erection Procedure:

1.5 Responsibility for Erection Procedure. In the event the fabricator’s contract does not include the erection of the structural steel, the erector shall be responsible for determining the erection procedure, for checking the adequacy of the connections for the uncompleted structure, for providing erection bracing or connection details and for coordinating the erection of the steelwork with the fabricator.

1.4.1.4 With respect to Clause 3.3 Revisions to Contract Documents, revise Clause 3.3.4 as follows:

3.3.4 Unless specifically stated to the contrary, the issue of revision documents or changes indicated on drawing approvals is not authorization by the client to release these revisions for construction. Any and all revisions to the contract shall be made in accordance with the provisions set out in the contract documents, and will be based on the fabricator and/or erector’s assessment of the impact of the proposed revisions on the contract price and schedule for completion of the work.

1.4.1.5 Revise Clause 3.4, Discrepancies as follows:

3.4 Discrepancies. In case of discrepancies between contract documents, the provisions of Standard Construction Document – CCDC2-2008 shall govern, unless agreed or instructed otherwise. In case of discrepancies between the structural documents and those of other trades, the documents for the trade responsible for deriving the required information shall govern.

1.4.1.6 Revise Clause 4.1.1 as follows:

4.1.1 At the time tenders are called, the steel fabricator shall receive a complete set of contract documents (including drawings and specifications) for all design disciplines and specialty consultants engaged on the project. When appropriate, these documents shall include complete structural drawings, conforming to the requirements for design drawings of the governing technical standard. Structural steel specifications should include any special requirements controlling the fabrication and erection of the structural steel, surface preparation and coating, and should indicate the extent of non-destructive examination, if any, to be carried out.

1.4.1.7 Clause 4.1.2, delete the last sentence.

1.4.1.8 Revise Clause 4.2 as follows:

4.2 Architectural, Mechanical, Electrical and Additional Specialty Consultants Drawings. Architectural, mechanical, electrical and additional specialty consultants drawings may be used as a supplement to the structural drawings to define detail configurations and construction information.

1.4.1.9 Revise Clause 5.6 as follows:

5.6 Review of Fabrication and Erection Documents. Erection diagrams, connection design details, shop details and field work details shall be submitted for review by the Engineer of Record in accordance with the provisions of the contract documents. The documents will be reviewed and returned in accordance with the provisions of the contract documents. The documents will be reviewed on a sampling basis for general conformity with
1.4.1.10 Revise Clause 6.6 as follows:

6.6 Inspection of Steelwork. Should the Owner wish to have an independent inspection and/or non-destructive examination of the steelwork, they shall reserve the right to do so in the tender documents. The fabricator and/or erector shall notify the inspection and testing company of the progress of the work so that timely inspection and testing may be arranged. The cost of this inspection and testing is the responsibility of the Owner. However, deficiencies in the work of the fabricator and/or erector requiring re-inspection and re-testing due to the frequency of the deficiency shall be the responsibility of the fabricator and/or erector.

1.5 ARCHITECTURALLY EXPOSED STRUCTURAL STEEL

1.5.1 Refer to Common Work Results for Metalwork Finishing, Section 05 05 19.

1.6 TOLERANCES

1.6.1 Conform to tolerances specified in the typical details and CISC Code of Standard Practice for Structural Steel.

1.6.2 Interfacing tolerances may not be compatible with the above. Review and coordinate interfacing tolerances so that the various elements come together properly.

1.6.3 Fabricating, shall be such that the effects of galvanizing, bending, cambering and the like, on the alignment of the completed members is minimized.

1.6.4 The tolerances of architecturally exposed structural steel members shall not exceed 1/2 of the standard camber and sweep tolerances specified in G40.20, unless noted otherwise.

1.7 QUALIFICATIONS

1.7.1 Any organization undertaking to weld shall be certified by the CWB to the requirements of Division 1, or Division 2.1 of CSA-W47.1.

1.7.2 Potential Trade Contractors are to successfully demonstrate that they have sufficient relevant experience of work similar in size, scope, complexity and risk to that shown on the documents and described herein.

1.7.3 Fabricator and erector shall have in place, Quality Control Program satisfying the requirements of ISO 9002 or another quality control program that is acceptable to the Consultant. In any case, the Quality Control Program shall satisfy the minimum requirements specified in the contract documents.

1.7.4 Design calculations shall be carried out by a qualified Professional Engineer licensed in the Province of Alberta, with a minimum of 10 years Canadian experience in the design of structural steel work, connections including design of weldments, or joist systems, as appropriate.

1.7.5 Engineers responsible for welding design, procedures and practice shall be certified in accordance with CSA W47.1, section 6.1.
1.7.6 Professional Engineers responsible for the design of steel work, connections, joist systems and the like, shall be covered under the Contractor’s General Liability Insurance Policy.

1.8 DESIGN

1.8.1 General

1.8.1.1 Design connections for the loads shown or implied in accordance with requirements of CSA-S16.

1.8.1.2 If the Trade Contractor’s engineer requires additional information or clarification to aid in the design of the work, this information shall be requested in a timely manner.

1.8.2 Connections

1.8.2.1 The Trade Contractor’s engineer shall be solely responsible for the design and detailing of all connections between the steel members including, but not limited to columns, beams, girders, trusses and braces, and between such members as spandrel angles and beams, hangers, stiffeners, etc., and their supporting members.

1.8.2.2 The Trade Contractor’s engineer shall also be responsible for the design and detailing of stiffeners, doubler plates and the like required to maintain the local strength and stability of a member and where these stiffeners and doubler plates are an integral part of the connection or where they affect the connection of other steel framing members. Examples include cranked sections, moment connections between columns and beams, connections to hollow structural sections and the like. Where connections are exposed to view, the detailing of stiffeners, double plates and the like is subject to review by the Architect.

1.8.2.3 Use types of shop or field connections shown on the documents, or in the absence of such information, use the most appropriate type of connections given the applied loads and the arrangement of members.

1.8.2.4 Design connections to safely withstand the combined primary effects of axial force, shear, moment and torque and any secondary effects due to welding.

1.8.2.5 Shear connections shall not be less than one half the depth of the connected member.

1.8.2.6 Where no axial force is shown for beam to column connections, connect beams framing into columns such that the combined capacities of the connection are able to resist a total horizontal force of 2% of the factored axial load in the column, in any direction. The column bracing force shall be proportioned and resisted by the members framing into the joint according to their relative axial stiffnesses, unless noted otherwise.

1.8.2.7 Unless noted otherwise, the design of all beams and girders is based on the assumption that fastener holes through flanges will not exceed 15% of the gross flange area. If the area of holes exceeds 15%, the member size shall be altered or reinforced accordingly and submitted for review.

1.8.2.8 Design hanger connections where bolts are loaded in tension such that they may be locked after pretensioning.
1.8.2.9  Design connections for fastening together double angles, double rectangular plates or bars, and the like, used to resist compression, tension, or bending in such a way that the slenderness ratio of any component, based on its least radius of gyration and the distance between interconnections, shall not exceed that of the built-up member. As a minimum, provide two intermediate battens or spacers along the length of all members.

1.8.2.10  The following types of connections are to be designed as slip-critical connections:

   1.8.2.10.1 Connections that utilize oversized holes;
   1.8.2.10.2 Connections that utilize slotted holes, except those where the applied load is normal to the long dimension of the slot.
   1.8.2.10.3 Connections subject to fatigue or frequent load reversal; and
   1.8.2.10.4 Connections where slippage cannot be tolerated, including:
      1.8.2.10.4.1 All moment connections (unless end plate type moment connections are used);
      1.8.2.10.4.2 Connections where welds and bolts share in transmitting shear forces at a common faying surface.

1.8.2.11  Bolts in the following types of connections are to be pretensioned in accordance with the requirements of S16;

   1.8.2.11.1 Slip-critical connections,
   1.8.2.11.2 Connections governed by seismic requirements,
   1.8.2.11.3 Connections where bolts are subject to tensile loads.
   1.8.2.11.4 Connections using oversized or slotted holes unless specifically designed to accommodate movement.
   1.8.2.11.5 Connections in steel trusses T1 to T5.

1.8.2.12  Design connections that are exposed to weather so that moisture and foreign matter cannot be trapped or gain entry to the interior of hollow built up members.

1.8.2.13  Design connections that are susceptible to the accumulation of moisture so that moisture and foreign matter cannot be trapped within the connectors or members framing into the connection.

1.8.2.14  Design and detail connections so they do not encroach upon architectural clearance lines or finishes.

1.8.2.15  Where connections between beams and columns and the like result in a loss of bearing for the steel deck, design and provide support for the steel deck, as required.

1.8.2.16  Design and provide end bearing connections of inclined members such that the bearing plane between the inclined members and their supporting members is horizontal.
1.8.2.17 Design connections to cast in plates to provide for the maximum deviation that can occur in erection and based upon the following:

1.8.2.17.1 Specified steel erection tolerances,

1.8.2.17.2 Maximum permissible tolerances in the location of inserts cast into concrete, specified in Section 03 10 00.

1.8.3 Trusses

1.8.3.1 Design truss member connections and truss bearings to safely transmit forces shown. Unless noted otherwise, the design of truss members is based upon the use of welded connections. If holes are made for connections, the member sizes shall be altered or reinforced as necessary.

1.8.3.2 Refer to structural drawings for locations of sliding bearing assemblies.

1.8.3.3 Design and connect trusses to furnish lateral support to the chords or flanges of supporting steel members. Anchor trusses to such members and at opposite ends by connections capable of withstanding a horizontal force of not less than 2% of end reaction of truss.

1.8.3.4 Where tie trusses are indicated, design connections to columns to safely develop 2% percent of column axial load or the loads shown, whichever is greater.

1.8.3.5 Design and provide end bearing connections of inclined trusses such that the bearing plane between the inclined trusses and their supporting members is horizontal.

1.8.3.6 Design connections to trusses to safely resist forces introduced into top chords of trusses by horizontal cross-bracing members.

1.8.4 Bearing Assemblies

1.8.4.1 General

1.8.4.1.1 Design bearings assemblies so they conform to the configurations shown and can safely transmit the loads and permit the movements noted.

1.8.4.1.2 Neoprene Bearing Pads

1.8.4.1.2.1 Design and provide neoprene bearing pads of a suitable shape and material that can safely transmit the forces shown while permitting rotation and movements specified.

1.8.4.1.3 Sliding Movement PTFE Joint Bearings

1.8.4.1.3.1 Design bearings to safely transmit the range of movements and loads indicated at a bearing stress not exceeding Table 11.3 in CSA S6-06, and such that the maximum static or dynamic co-efficient of friction shall not be greater than 0.06 at a bearing stress of 21 MPa.
1.8.1.3.2 Design bearings to provide a range of movements of plus or minus 25 mm (1") in any direction, unless noted otherwise.

1.8.5 Colour Coding
1.8.5.1 When different grades of steel are supplied, use a colour coding technique to aid in the shop and field identification of these different grades. Each member used shall bear its particular colour code as required by G40.21.

1.9 SUBMITTALS
1.9.1 Submit submittals in accordance with Section 01 33 00 – Submittal Procedures.
1.9.2 Sustainable Design Submittals: Coordinate project sustainable design requirements with Section 01 35 31 – LEED® Special Project Procedures.
1.9.3 Quality Control Program
1.9.3.1 Include with the tender documents a copy of fabricators and erectors standard Quality Control Program.
1.9.3.1.1 Prior to commencement of the work, fabricator and erector are to submit a complete Quality Control Program specific to the project for review by the Consultant.

1.9.4 Qualifications of Professional Engineer
1.9.4.1 Submit appropriate documentation for each professional engineer who will be responsible for the steel work; including the erection and design of connections, weldments, joist systems and the like, verifying the minimum qualification requirements outlined in this specification.

1.9.5 Proof of Insurance
1.9.5.1 Submit proof of adequate insurance coverage for each professional engineer who will be responsible for the steel work, connections, joist systems and the like.

1.9.6 Shop Drawings
1.9.6.1 General
1.9.6.1.1 Professional engineer(s) responsible for the structural steel work, connections, joist systems and the like shall either:
1.9.6.1.1.1 Seal and sign all necessary shop drawings, or
1.9.6.1.1.2 Submit a sealed and signed letter prior to commencement of shop drawing preparation stating that they have been retained by the steel fabricator to carry out the design of steel connections, joist systems and the like AND shall submit a second letter after shop drawing preparation is complete stating that the design of the steel work, for which they are responsible, has been completed in
accordance with the contract documents and relevant building codes, standards and acts.

1.9.6.1.2 Unless noted otherwise, on all shop drawings provide adequate space immediately above the drawings title block for a Consultant’s Shop Drawing review stamp. Where requested by the Consultant, the stamp is to be inserted by this section directly into the shop drawing prior to submission. The stamp shall be positioned in the same location on each shop drawing, and in no case shall the allocated space be less than 63 x 75 mm (2.5 × 3”). Request the details of these requirements from the Consultant no less than 2 weeks before the commencement of shop drawings.

1.9.6.1.3 If the professional engineer(s) choose to seal and sign the shop drawings, as noted above, all shop drawings must be sealed and signed, except for erection diagrams which only contain design information (member sizes, forces, loads and the like) which is shown on the contract documents. If any field work details, notes to the erector or notifications are made on the erection diagrams, then they must be sealed and signed by the Trade Contractor’s engineer.

1.9.6.1.4 Reproduction of the structural drawings, to serve as a basis for the preparation of erection or setting drawings, will be permitted. If the fabricator and/or erector make use of the structural drawings for this purpose, they shall take full responsibility for verifying all information shown on the drawings and the completeness of the information provided in a manner equivalent to the preparation of erection diagrams. Cost of reproduction to be paid for by this section. Any identification or reference to the Owners or Consultants is to be removed from all structural drawings which are used by the fabricator and erector.

1.9.6.1.5 Well in advance of fabrication; submit structural steel connection design details, shop, erection, and setting drawings for review by the Consultant. Submit field work details for review by the Consultant.

1.9.6.1.6 Shop drawings shall be submitted for all structural steel work and shall be submitted in complete packages so that individual parts and the assembled unit can be reviewed together. This section and the applicable drawings used in the development of the shop drawings shall be clearly referenced on each shop drawing to facilitate review. Detail member marks shall be cross referenced on the erection drawings to facilitate a quick identification of the members.

1.9.6.1.7 When shop drawings are revised and resubmitted, all revisions to the drawings shall be clearly identified by means of “bubbles”, “clouds” or other obvious means.

1.9.6.1.8 All shop drawings submitted must clearly indicate the initials of the individual who checked the shop drawings before they were submitted for review.
1.9.6.1.9 Submit a 3D digital model (Tekla, REVIT, or 3D pdf) with each submission detailed piece drawings.

1.9.6.2 Connection Design Details

1.9.6.2.1 Submit connection design details for review by the Consultant, prior to the submission of the detailed piece drawings.

1.9.6.2.2 Connection design details shall be submitted for all standard and non-standard connections, and shall be referenced to the structural drawings.

1.9.6.3 Erection Drawings

1.9.6.3.1 Submit erection drawings for review prior to preparation of detailed piece drawings.

1.9.6.3.2 Erection drawings shall be included with each submission of detailed piece drawings, connection details and calculations.

1.9.6.3.3 Erection drawings shall clearly indicate or highlight the member marks that are being submitted for review.

1.9.6.3.4 Erection drawings shall clearly show all setting out dimensions for the structural steel frame, including dimensions that have been confirmed by site measurement. Dimensions shall be tied to relevant grid lines or reference points.

1.9.6.3.5 Indicate on erection diagrams steel lintels and other structural shapes which are embedded in masonry or cast-in-place concrete and not connected to structural steel.

1.9.6.3.6 Erection drawings shall clearly show all AESS members and their respective Category.

1.9.6.3.7 When erection drawings are being submitted for “marks only” or for “reference only”, this shall be clearly indicated on the drawings or transmittal.

1.9.6.4 Detailed Piece Drawings

1.9.6.4.1 Submit detailed piece drawings for all structural members.

1.9.6.4.2 As a minimum, show the following:

- layout;
- member sizes;
- connection details, including appropriate reference to connection design calculations;
- splice locations and details;
- truss details;
- holes;
- camber;
- finishes;
- grades of steel;
- bolt material;
- identify location and extent of all pretensioned bolts, slip critical bolts and class of surface preparation;
- clearly identify locations and details of all slip critical connections;
- sliding PTFE bearing details including materials, size and thickness, setting out dimensions and load capacity; and
  architectural clearance lines and finishes where connections and the like may encroach with other work.

1.9.6.5 Field Work Details

1.9.6.5.1 Submit details for all field work in accordance with the requirements of Division 1.

1.9.6.5.2 The location of field work details shall be clearly identified or referenced on the erection drawings.

1.9.6.5.3 Prepare setting drawings showing dimensions and details for setting structural steel bearings, anchorages, assemblies and the like where they interface with other building components.

1.9.6.5.4 Co-ordinate structural steel shop and erection drawings with shop drawings of other interfacing work.

1.9.6.5.5 Submit all non-prequalified welding procedures, stamped as approved by the Canadian Welding Bureau and correlated to the appropriate shop and erection drawings.

1.9.6.5.6 Furnish inspection company with a copy of each shop, erection, and setting drawing bearing the Consultant’s shop drawing stamp marked reviewed.

1.9.6.6 As-Built Drawings

1.9.6.6.1 Mark on a complete set of final drawings any changes, additions, or deletions that occur during construction as a result of the Trade Contractor’s work, change orders or for any other reason.

1.9.6.6.2 For all shop drawings marked “Reviewed as Noted” or “Revise and Resubmit”, update and submit a record set of these drawings at the completion of the structural work. Ensure that these drawings reflect the changes and are coordinated with the final drawings noted above.

1.9.6.7 Submit a 3D digital model (Tekla or REVIT) with each submission of erection or detailed piece drawings.

1.9.7 Architecturally Exposed Structural Steel (AESS)

1.9.7.1 Refer to Common Work Results for Metalwork Finishing, Section 05 05 19.

1.9.8 Surveys
1.9.8.1 Preconstruction Survey: Where interface with existing construction occurs, the existing construction shall be surveyed and such survey submitted before related shop drawings are prepared.

1.9.8.2 Work by Others: Examine all work prepared to receive work of this section and report any defects affecting installation to Consultant for correction. Commencement of work will be construed as complete acceptance of preparatory work by others. This section alone shall be responsible for checking of the dimensions and coordination of the structural steel work with other trades.

1.9.8.3 Submit surveys showing position of structural steel members. Submit survey results on any given floor before concrete is placed on the floor. As a minimum include the following:

1.9.8.3.1 location of centreline of all columns with respect to grids at each floor level;

1.9.8.3.2 elevation of tops of girders, joists, trusses and beams at ends, midspan and at cantilevered ends, at all floors and roof, before and after placing of concrete.

1.9.9 Calculations

1.9.9.1 Submit calculations bearing the seal and signature of the qualified Professional Engineer licensed in the Province of Alberta and such further proof as may be necessary to show that non-standard connections and truss connections and the like conform to the requirements set forth herein.

1.9.10 Cambering Procedures

1.9.10.1 Submit detailed cambering procedures for beams, girders, trusses and the like for review prior to start of fabrication.

1.9.10.2 Bearing Assemblies

1.9.10.3 Submit shop drawings and technical specifications for the PTFE sliding bearing assemblies, and neoprene bearing pads to the Consultant for review. Drawings shall bear the seal and signature of a qualified Professional Engineer licensed in the Province of Alberta.

1.9.11 Erection Procedures

1.9.11.1 Erection procedures and erection bracing are the sole responsibility of the Trade Contractor.

1.9.11.2 Well in advance of erection, submit procedures, methods, sequences of erection, temporary shoring and guyng, and equipment proposed for use in erecting structural steel and bearing the seal and signature of the qualified Licensed Professional Engineer licensed in the Province of Alberta.

1.9.11.3 Submit for the Consultant's review, complete details of the pretensioning procedures, instrumentation and system of measurements to be used to verify the tensile stresses within the 6 MPa (0.9 ksi) tolerance.

1.9.12 Substitution
1.9.12.1 It is the Trade Contractor's responsibility to verify the availability of the steel sections shown on the structural drawings at time of tender, and to immediately notify the engineer of record if any of the sections are not readily available and need to be substituted. Substitutions after the time of tender will be at the cost of the Trade Contractor.

1.9.13 Mill Test Certificates

1.9.13.1 Submit to the Consultant copies of mill test certificates covering chemical and physical properties of steel used in this work, including mill test reports for all structural bolts, a minimum of 4 weeks prior to commencing fabrication.

1.9.14 Colour Code

1.9.14.1 Submit colour code proposed or other agreed methods to identify various grades of structural elements.

1.9.15 Non-destructive Testing

1.9.15.1 Submit all in-house non-destructive testing results of shop and field work together with inspector/technician certification status and test procedures used.

2 Products

2.1 MATERIALS

2.1.1 Provide only new material manufactured in North American mills or the following international mills Corus (UK), ARCELOR (Luxembourg, free from defects impairing strength and durability. New materials are to be in accordance with the Referenced Standards. Where sections identified are not available from the mills noted or where the Trade Contractor chooses to use sections produced by other mills, provide new materials of minimum strength and minimum quality noted. For sections that are not produced by North American mills, or additional mills listed above the Trade Contractor shall submit written requests for review of the alternate mill to the Consultant before proceeding with material procurement. The Consultant reserves the right to require physical test data (in addition to the mill test reports) proving that the steel from the proposed mill meets the specification requirements. Provide such data for each 100 tonnes of material supplied.

2.1.2 Structural Steel:

2.1.2.1 Structural wide flange shapes (W) to conform to CAN/CSA-G40.20/G40.21 grade 350W or ASTM A992/A992M grade 50 (ksi).

2.1.2.2 Structural welded wide flange shapes (WWF) to conform to CAN/CSA-G40.20/G40.21 grade 350W.

2.1.2.3 Angles, plates and channels (L, C) to conform to CAN/CSA-G40.20/G40.21 grade 300W unless noted otherwise. Steel plates (including stiffener and connection plates) in Trusses T1 to T5 to conform to STM A572 Grade 50.

2.1.2.4 Hollow structural sections (HSS) to conform to ASTM A500 GRADE C.

2.1.3 Anchor Rods: Conform to 300W threaded rod conforming to CSA G40.21-M, unless noted otherwise.
2.1.4 Bolts, Nuts and Washers: Conform to ASTM A325M A490M. Galvanized A325 bolts over 22mm (7/8") diameter shall have a dry lubricant on threads such as Johnson’s Stick Wax #140 before installation.


2.1.6 Direct Tension Indicators: Provide direct tension indicators meeting ASTM F959-01a at all slip critical and direct tension connections as defined by the “Specification for Structural Joints using ASTM A325 or A490 bolts” where A325 bolts larger than 22mm (7/8") diameter are used. This method of tension control is required at moment connections in rigid frames, cantilevers, and all trusses and roof steel, and where specifically called out on the contract drawings.

2.1.7 Deformed Bar Anchors: Shall be Nelson, flux filled, type D2L or approved alternative.

2.1.8 Shear Stud Connectors: Headed studs shall be manufactured by Nelson (or approved alternative) and shall be made from mild steel conforming to ASTM A108 grade 1010 through 1020. Headed studs shall be welded per manufacturer’s recommendations; mechanical properties of headed studs shall be in accordance with AWS D1.1.

2.1.9 Shop Paint/Primer – Refer to Common Work Results for Metalwork Finishing, Section 05 05 19.

2.1.10 Sliding PTFE Bearings: as manufactured and supplied by Sorbtex (R.J Scearce Assoc., Burlington), or by Goodco Z-Tech or an approved consisting of bearing assembly with bonded PTFE sheets safely transmitting the loads and movements indicated and conforming to CSA S6-06.

2.1.11 Neoprene Bearing Pads: Molded or cut from a sheet of high-grade, neoprene synthetic rubber compound and conforming to current issue of CSA S6-06.

3 Execution

3.1 FABRICATION

3.1.1 Provide holes up to 12 mm (½") in diameter, as required, to permit the attachment of other materials. Ensure cross sectional area of section is not reduced by more than 10% at any point on its length. Additional miscellaneous holes shall not be permitted in all truss members and feature stairs.

3.1.2 Provide 20 mm (¾") drain holes in closed sections to prevent water build-up during erection. Ensure drain holes remain free to drain throughout construction and are not plugged by subsequent construction activities.

3.1.3 Splices, other than those shown, shall not be permitted in members without Consultant's approval. If approval is given to permit welded splices, they shall be non-destructively tested at no extra cost to the Owner.

3.1.4 Unless noted otherwise on the drawings, provide a 10 mm (3/8") cap plate for all hollow built-up members. Provide continuous seal weld around cap plate.

3.1.5 Seal all hollow built-up members exposed to weather with continuous seal welds, incorporating structural welds where shown or required.

3.1.6 Thickness of baseplates 100 mm or greater is nominal and allows for a maximum reduction of 6 mm for milling to the requirements of CSA S16.
3.1.7 Cambers
3.1.7.1 Provide the indicated camber to trusses, beams, and girders in such a manner as to provide a uniform parabolic profile. Ensure that the method used to provide camber does not reduce the safe load carrying capacity or cause distortion of the members.

3.1.7.2 Camber stated on the drawings is the required camber after erection.

3.1.8 Openings
3.1.8.1 Conform to the requirements shown for location, size, and reinforcement of openings through structural steel.

3.1.8.2 No openings other than those shown on the structural drawings will be permitted without the Consultant's approval.

3.1.9 Bending Steel Sections
3.1.9.1 Bend sections to the geometry noted on the contract documents in such a manner as to provide a smooth uniform profile. Ensure that the method used to bend the steel sections does not reduce the safe load carrying capacity or cause distortion of the members.

3.1.10 Cutting of Heavy Sections
3.1.10.1 Where ASTM A6 Groups 4 or 5 rolled shapes or plates 40 mm (1-1/2") or thicker are to be jointed by partial or full penetration welds in tension preheating shall be required for all thermal cutting operations. Preheat shall be sufficient to prevent cracking but in no case less than 65°C (150°F). Weld access holes and copes shall be ground to a smooth radius after cutting and testing for cracks by the magnetic particle method. All cut edges shall be free of sharp notches and gouges.

3.1.11 Holes & Cutting
3.1.11.1 All holes shall be accurately drilled or punched. Burning or drifting unfair holes will not be permitted. Holes that must be enlarged shall be reamed. Holes for the attachment of work by others shall be provided as required. Drift pins will be allowed only to bring together the several parts for connection.

3.1.11.2 Holes shall be provided in members to permit connections to the work of other trades or contracts.

3.1.11.3 The use of manual gas-cutting in the shop may be used only if automatic or semi-automatic methods are not possible. Cope for pipes and ducts as shown.

3.1.12 Bolting
3.1.12.1 Drive bolts accurately into the holes without damaging the threads and heads. Bolts heads and nuts shall rest squarely against metal surfaces.

3.1.12.2 Where bolts are to be used on beveled surfaces having slopes greater than 1 in 20 with a plane normal to the bolt axis, provide beveled washers to give full bearing to the thread or nut.
3.1.12.3 Bolt threads of unfinished bolts shall be upset to prevent the nuts from backing off.

3.1.12.4 Label and ship anchor rods and base plates in sets indicating size and locations of columns and deliver in ample time prior to the start of related concrete work. Furnish templates together with instructions for setting of anchor rods. Ascertained that anchor rods and other embedded items are set properly during the progress of the work. Provide 75 x 75 x 7 mm plate washers between top of base plate and bottom of anchor rod nuts.

3.1.13 Welding of Structural Steel

3.1.13.1 Pre-weld Inspection

3.1.13.1.1 The surface to be welded and the filler material to be used shall be subject to inspection by quality control personnel before welding is performed.

3.1.13.2 Method and Type

3.1.13.2.1 All welding shall be electric arc welding and shall comply in all respects with the codes and specifications herein noted covering the specifications for design, fabrication, and inspection of welded structures and the qualifications of welders and supervisors. The heat, input, length of weld, and sequence weld and cooling process shall be controlled to prevent distortions.

3.1.13.2.2 For weldments comprised of plates in more than one plane and whose configuration could cause restraint to uniform cooling of the weldment, conform to detailed welding procedures prepared by the Trade Contractor’s Engineer.

3.1.13.2.3 For weldments comprised of plates thicker than 40 mm, take adequate precaution to control welding and cooling processes in order to control thermal shrinkage stresses. Use stress relieving techniques where necessary. Each welder shall mark his identification symbol on this work.

3.1.14 Column Length Adjustments

3.1.14.1 Make allowance in column fabrication lengths for differential shortening between columns supporting trusses and adjacent floor framing columns. This shall be accomplished by fabricating all columns supporting trusses with increased length as shown on the drawings.

3.1.15 Architecturally Exposed Structural Steel

3.1.15.1 Also refer to Common Work Results for Metalwork Finishing, Section 05 05 19.

3.1.15.2 Fabricate and assemble AESS in the shop to the greatest extent possible.

3.1.15.3 Locate field connections in AESS assemblies at concealed locations approved by the Consultant.

3.1.15.4 Perform fabrication with special care and necessary straightening to maintain the condition of the material as described herein. AESS surface quality to be
consistent with AESS Category specified and the visual samples prepared prior to fabrication.

3.1.15.5 Show clearly the required fabrication tolerances on shop drawings. Show the required tolerances for setting embedded items on erection drawings.

3.1.15.6 Make copes, mitres and butt cuts in surfaces exposed to view within specified tolerances. Plan erection sequence so that these tolerances can be maintained.

3.1.15.7 All exposed edges of plates shall be universal mill or guided flame cut. Exposed cut edges of beam flanges shall be guided flame cut. Cut surfaces shall be equal in smoothness to a mill finish.

3.1.15.8 Except as otherwise shown on the drawings, all shop and field assembly shall be done by welding.

3.1.15.9 Form and weld all joints exposed to weather to exclude water by the use of "seal" welds.

3.1.15.10 Exposed welds, shall be ground smooth and otherwise finished flush and even with adjacent surfaces. Grinding is not required for well-formed fillet welds.

3.1.15.11 Grind bevel welds smooth, forming neat, well-made corners.

3.1.15.12 Grind smooth any welds on structural steel members in the finished building that are within the reach of the public.

3.2 ERECTION

3.2.1 General

3.2.1.1 Refer to erection procedures and construction sequencing shown on the contract drawings.

3.2.1.2 Bracing members and anchor rods shown are for the finished structure and may not be adequate to resist forces present during construction.

3.2.1.3 Maintain erection bracing until completion of entire structure including floor and roof decks and slabs, and/or other elements which are part of the lateral load resisting system.

3.2.1.4 Carry out erection operations, including installation of any temporary guying and shoring required, ensuring that the existing structure or members already erected are not loaded in excess of their safe load carrying capacity.

3.2.1.5 Erection bracing must be adequate to restrict lateral drift per storey to an appropriate amount to ensure the steel erection can be completed within the necessary tolerances.

3.2.1.6 During erection, forces or reactions in the steel frame members and their connections might exceed those on which the design is based. Determine the magnitude of such erection forces and reactions and take such measures as are necessary to ensure that the safety and stability of the structure is maintained until the entire structure, including floor and roof slabs is complete.
3.2.1.7 Nuts on bolts shall be prevented from working loose by use of lock washers, lock nuts, jam nuts, thread burring or other approved methods.

3.2.1.8 Runoff tabs shall be removed where required by the governing technical standard, or where they interfere with clearances required by other disciplines or would be exposed to view in the completed building.

3.2.1.9 Where steel bars or strap anchors are shown connected to structural steel members, weld these bars/anchors to the steel members in a manner to fully develop the strength of the bars/anchors.

3.2.1.10 Note that erection of structural steel may be dependent on the work and progress of related trades. For example, portions of the roof structure may have to be erected after roof mechanical units are in place. Co-ordinate this work with the appropriate trades.

3.2.1.11 Report to the Consultant where members cannot be erected within the specified tolerances without modification or special procedures. Take corrective measures to the Consultant’s approval.

3.2.2 Pre-Steel Erection Conference

3.2.2.1 At least 60 days prior to the commencement of steel erection, the Construction Manager shall hold a pre-erection conference to review the detailed requirements and staging for the steel erection.

3.2.2.2 The Construction Manager shall require responsible representatives of every party who is concerned with the steel erection to attend the conference, including but not limited to the following:

- 3.2.2.2.1 Construction Manager
- 3.2.2.2.2 Steel Erector
- 3.2.2.2.3 Erectors Surveyor
- 3.2.2.2.4 Steel Deck Trade Contractor
- 3.2.2.2.5 All Inspection and Testing Agencies
- 3.2.2.2.6 Consultant
- 3.2.2.2.7 Owner’s Representative

3.2.2.3 Minutes of the meeting shall be recorded and distributed to all parties concerned within 5 days of the meeting.

3.2.2.4 The minutes shall include a detailed outline of the steel erection procedure including a schedule of milestone dates for erection staging, surveying and sign-offs which will represent the agreements reached by all parties involved.

3.2.3 Sequence of Construction

3.2.3.1 During winter months the pouring of some slabs on deck may be delayed. Provide any additional guy ing or bracing to compensate for the temporary loss of diaphragm action and additional dead load, as deemed necessary.
3.2.3.2 Equipment: Operate all machinery, apparatus and staging required for the erection of steel work in a safe manner. Install, maintain and remove without damage to the other work, scaffolding, erection bracing and other equipment, etc. as may be necessary or required.

3.2.3.3 Bracing: Securely brace the frame during erection to safely resist all dead loads, lateral loads and other erection stresses. Fully tighten all bolts as soon as possible as the work progresses. Design erection bracing or guying to limit lateral floor-to-floor displacement to an appropriate amount to ensure steel erection can be completed within necessary tolerances.

3.2.3.4 Errors: Immediately report to the Trade Contractor any errors in shop fabrication or deformations resulting from handling and transportation that prevent the proper assembly and fitting of parts. Make suggestions for corrective work and obtain approval of the method of correction. Approved corrections shall be made expeditiously at no additional cost to the Owner.

3.2.3.5 Column Base Plates: Column base plates shall be supported and aligned on steel shims or setting bolts. After the supported members have been plumbed and properly positioned, the anchor nuts shall be tightened, in preparation for grouting. Wedges and shims shall be cut off flush with the edges of plates and shall be left in place. All base plates greater than 600 mm (2’0”) in any dimension shall be set on steel angle seats or shim packs. Base plates larger than 900 mm (3’0”) shall be set on steel angle seats only.

3.2.3.6 Leveling Plates: Leveling plates shall be set to the established lines and elevations. Provide steel shims as required for proper positioning of column/baseplate.

3.2.4 Bolting and Welding of Structural Steel

3.2.4.1 Splices: Fastening of splices of compression members shall be done after the abutting surfaces have been brought completely into contact. Splices will be permitted only where indicated on the contract drawings or the reviewed shop drawings.

3.2.4.2 Driftpins: These may be used only to bring together the several parts, and shall not be used in such a manner as to distort or damage the steel. Poor matching of holes shall be corrected by drilling to the next larger size and the use of larger size bolts. Plug welding and redrilling will not be permitted, unless a specific instance arises and is approved by the Consultant.

3.2.4.3 Hammering: Hammering which may injure or distort the members will not be permitted.

3.2.4.4 Additional Material: If the Trade Contractor furnishes additional material for the purpose of erection or if the erection method requires that material be added to certain members, the required modifications and the additional metal parts shall be paid for by the Trade Contractor.

3.2.5 Bearing on Concrete

3.2.5.1 Set steel baseplates and bearing assemblies true and level at the proper elevation so that upon grouting, they will have full bearing.

3.2.5.2 When directed by the Consultant, lift at least 3 grouted bases so that the adequacy of grouting can be examined. If defects are found, more bases will
have to the raised. Lifting of base plates that are attached to columns may not be practical. In such a case grouting of base plate must be done on a prototype prior to grouting building base plates.

3.2.6 Bearing Assemblies, Sliding Movement PTFE Joint Bearings, Neoprene Bearing Pads

3.2.6.1 Place the bearings in the location and elevation required, ensure that they are installed level and secured in position.

3.2.7 Lintels

3.2.7.1 Unless a reinforced block or concrete lintel is noted, provide loose steel lintels, to the details shown, over openings and recesses including those for mechanical or electrical services in masonry walls or partitions.

3.2.8 Architecturally Exposed Structural Steel

3.2.8.1 Set AESS accurately in locations and to elevations indicated, and according to CSA S16.

3.2.8.2 In addition to the special care used to handle and erect AESS, employ the proper erection techniques to meet the requirements of the specified AESS Category:

3.2.8.2.1 AESS Erection tolerances: Erection tolerances shall meet the requirements of standard frame tolerances for structural steel per CSA S16, unless noted otherwise.

3.2.8.2.2 Bolt Head Placement: All bolt heads shall be placed as indicated on the contract documents. Where not noted, the bolt heads in a given connection shall be placed to one side;

3.2.8.2.3 Removal of field connection aids: Run-out tabs, erection bolts and other steel members added to connections to allow for alignment, fit-up and weldings in the field shall be removed from the structure. Welds at run-out tabs shall be removed to match adjacent surfaces and ground smooth. Holes for erection bolts shall be plug welded and ground smooth where specified;

3.2.8.2.4 Filling of connection access holes: Filling shall be executed with proper procedures to match architectural profile, where specified;

3.2.8.2.5 Field Welding: Weld profile, quality, and finish shall be consistent with Category and visual samples, if applicable, approved prior to fabrication.

3.2.9 Erection of Large Steel Building Frames Having No Expansion Joints

3.2.9.1 Erect structural steel work to conform with S16 and additional requirements as specified herein.

3.2.9.2 Erect the structural steel work so that the framing is plumb when the mean temperature of the steel frame is at 20°C (70°F). Since the building is large and has no expansion joint, some members may be required to be erected out of plumb if the erection is carried out at temperature greatly differing that noted above.
3.2.9.3 Provide the Consultant with the procedures proposed to achieve this requirement.

3.2.9.4 Make adequate provisions for erection stresses and for sufficient erection bracing to keep the structural steel in true alignment in its designated position, until completion of the entire structure, including floor and roof decks and/or other elements which are part of the wind resisting system. Any bracing members shown are those required for the finished structure and may not be sufficient for erection purposes. Design erection bracing so that will not restrict any movements of the frame anticipated.

3.2.9.5 Do not install the connections of the permanent brace frames until the adjacent columns are plumb.

3.3 PROTECTION

3.3.1 Cleaning Steel

3.3.1.1 Clean structural steel and joists in accordance with table below:

3.3.1.2 Clean surfaces within 50 mm (2") of any field weld location of materials that would prevent proper welding or produce objectionable fumes while welding is being done.

3.3.2 Painting

3.3.2.1 Except where steel is to be galvanized, shop paint structural steel in accordance with the table below:

<table>
<thead>
<tr>
<th>Environment</th>
<th>Preparation</th>
<th>Primer/Paint</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>Inside Vapour Barrier</td>
<td>SSPC-SP3 Power Tool Cleaning</td>
<td>Leave unpainted</td>
<td>Unpainted steel for Steel receiving fire treatment.</td>
</tr>
<tr>
<td>Inside Vapour Barrier (steel exposed to view or AESS)</td>
<td>SSPC-SP6 Commercial Blast Cleaning</td>
<td>CISC/CPMA 2-75</td>
<td>Note additional requirements for AESS elsewhere in the specification.</td>
</tr>
<tr>
<td>Outside Vapour Barrier (steel)</td>
<td>SSPC-SP6 Commercial Blast Cleaning</td>
<td>Zinc-rich primer</td>
<td></td>
</tr>
<tr>
<td>Outside Vapour Barrier – All remaining steel</td>
<td>Galvanize</td>
<td></td>
<td>Note additional requirements for galvanizing elsewhere in the specification.</td>
</tr>
</tbody>
</table>

3.3.2.2 No shop paint is required for items inside the vapour barrier that are to be encased in concrete and surfaces that are to have concrete placed against them or that are to be covered in cementitious fireproofing.

3.3.2.3 Where shear connectors are to be field welded through the low flute of the steel deck, the top surface of the top flange, which is to receive the shear studs, is to be unpainted and free of heavy rust, mill scale, sand, or other foreign materials which will interfere with the stud welding operation.
3.3.2.4 Upon completion of erection, clean with mechanical brush and apply primer to welds, bolts and at locations where original primer is damaged.

3.3.2.5 Additional Requirements for Architecturally Exposed Structural Steel:

3.3.2.6 Apply one additional shop coat of paint as specified to parts of shop coated steel surfaces that will be inaccessible after erection.

3.3.2.7 After erection and immediately after grinding welds, etc. touch up and paint with one coat of same paint as shop coat, all damaged and abraded spots, including any unpainted areas. Completely remove anti-spatter coating, if used before field touch-up painting.

3.3.3 Galvanizing

3.3.3.1 In accordance with CAN/CSA-G164 including Appendix B, fully galvanize cooling tower structural steel, structural steel lintels, masonry shelf angles, and other steel materials exposed to weather including connection material and inserts.

3.3.3.2 Where galvanizing process may distort the members, submit procedures for review by the Consultant and make good to tolerances noted in the contract documents.

3.3.3.3 Galvanize members after shop welding has been completed.

3.3.3.4 Do not weld to galvanized steel members. Where welding is necessary, remove galvanizing by grinding.

3.3.3.5 Identify at time of tender any splices that are required due to the size, length or weight constraints imposed by the galvanizing process.

3.3.4 Cold Weather Protection

3.3.4.1 During cold weather, protect members from damage due to water freezing in confined areas.

3.3.5 Corrosion

3.3.5.1 Protect milled surfaces to prevent corrosion prior to erection.

3.4 QUALITY CONTROL

3.4.1 Visual Inspection

3.4.1.1 As a minimum, carry out visual inspection of all shop and field welds in accordance with CSA W59.

3.4.2 Non-Destructive Testing

3.4.2.1 Non-destructive testing to be carried out by radiography, magnetic particle or ultra sonic methods, whichever is more appropriate.

3.4.2.2 In addition to visual inspection, the Trade Contractor is to include the following requirements for non-destructive testing:

- All built up steel members.
- 100% of all welded truss connections including truss to truss connections both in the shop and on site.
3.4.2.3 Any deficient welds identified by means of NDT, shall be repaired at the Trade Contractor’s expense.

3.4.2.4 Welds found deficient in dimensions, but not in quality may be enlarged by additional welding. Any weld found deficient in quality shall be removed by chipping or gouging and the weld shall be remade.

3.4.2.5 Include for full NDT of all shop welded connections in all truss elements fabricated.

3.4.2.6 Include for full NDT of all shop welded splices.

3.4.2.7 Include for an additional 20% random NDT of remaining shop welded connections.

3.4.3 Additional Testing for Steel Produced by “Other Mills”.

3.4.3.1 Physical samples of the finished structural steel material shall be taken at the Consultant’s discretion for verification or determination of either the mechanical properties and or the chemical composition. All physical samples tested shall meet the requirements set out in CAN/CSA G40.20 and G40.21.

3.4.4 General

3.4.4.1 Bring to the attention of the Consultant any defects in the work or departures from the Contract Documents which may occur during construction. The Consultant will decide upon corrective action and give recommendations in writing.

3.4.4.2 The Consultant's general review during construction and inspection and testing by Independent Inspection and Testing Companies reporting to the Consultant are both undertaken to inform the Owner of the Construction Manager’s performance and shall in no way augment the Construction Manager’s quality control or relieve the Construction Manager of contractual responsibility.

1.1 NOTIFICATION

3.4.5 Prior to commencing significant segments of the work, give the Consultant and Independent Inspection and Testing Companies appropriate notification so as to afford them reasonable opportunity to review work previously completed. Failure to meet this requirement may be cause for the Consultant to classify the work as defective.

3.5 INSPECTION AND TESTING

3.5.1 The Owner will appoint the Independent Inspection and Testing Companies to make inspections or perform tests as the Consultant directs. The Independent Inspection and Testing Company shall be responsible only to the Consultant, and shall make only such inspections or tests as the Consultant may direct.

3.5.2 When defects are revealed, the Consultant may request, at the Trade Contractor's expense, additional inspection or testing to ascertain the full extent of the defect.

3.5.3 Inspection and testing may also include the non-destructive testing of the full butt welds, testing of headed studs on beams and on connections to be cast into concrete.
3.6 DEFECTIVE MATERIALS AND WORK

3.6.1 Where evidence exists that defective work has occurred or that work has been carried out incorporating defective materials, the Consultant may have tests, inspections or surveys performed, analytical calculations of structural strength made and the like in order to help determine whether the work must be replaced. Tests, inspections or surveys or calculations carried out under these circumstances will be made at the Trade Contractor’s expense, regardless of their results, which may be such that, in the Consultant’s opinion, the work may be acceptable.

3.6.2 All testing shall be conducted in accordance with the requirements of The Building Code, except where this would, in the Consultant’s opinion, cause undue delay or give results not representative of the rejected material in place. In this case, the tests shall be conducted in accordance with the standards given by the Consultant.

3.6.3 Materials or work which fail to meet specified requirements may be rejected by the Consultant whenever found at any time prior to final acceptance of the work regardless of previous inspection. If rejected, defective materials or work shall be promptly removed and replaced or repaired to the satisfaction of the Consultant, at no expense to the Owner.

END OF SECTION
1 General

1.1 WORK INCLUDED

1.1.1 Section 01 31 19 - Project Meetings

1.1.2 Section 01 33 00 – Submittal Procedures

1.1.3 Section 01 33 50 - Delegated Design Submittals

1.1.4 Section 01 35 31 - LEED Special Project Procedures

1.1.5 Provide all labour, materials, plant and equipment to complete the steel deck work including, but not limited to, the following:

1.1.5.1 Steel deck and accessories, including all gauge metal closures;

1.1.5.2 Framing for openings up to and including 450 mm (18") in roof deck and 300mm (12") in floor deck; and

1.1.5.3 Shear stud connectors.

1.2 RELATED WORK SPECIFIED ELSEWHERE

1.2.1 Concrete Reinforcement, Section 03 20 00.

1.2.2 Cast-in-Place Concrete, Section 03 30 00.

1.2.3 Structural Steel, Section 05 12 00 Support framing for openings larger than 450 mm (18") in roof deck, 300 mm (12") in floor deck and deck edge supports where loss of bearing for the steel deck occurs.

1.3 REFERENCE STANDARDS, CODES, AND ACTS

1.3.1 Conform to the Alberta Building Code (The Building Code) as amended by all subsequent Alberta Regulations issued to the date of this specification and applicable acts of authorities having jurisdiction.

1.3.1.1 ASTM A36/A36M-14 - Carbon Structural Steel.

1.3.1.2 ASTM A108-13 - Steel Bar, Carbon and Alloy, Cold-Finished.

1.3.1.3 ASTM A653/A653M-13 - Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.

1.3.1.4 CSA-S136-07 - Design of Cold-Formed Steel Structural Members.

1.3.1.5 CSA-W47.1-09 - Certification of Companies for Fusion Welding of Steel Structures.

1.3.1.6 CSA-W48-06 - Filler Metals and Allied Materials for Metal Arc Welding.

1.3.1.7 CSA-W55.3-08 - Certification of Companies for Resistance Welding of Steel and Aluminum.

1.3.1.8 CSA-W59-03 (R2008) - Welded Steel Construction (Metal Arc Welding).

1.3.1.9 CSSBI 10M-08 - Standard for Steel Roof Deck.

1.3.1.10 CSSBI 12M-08 - Standard for Composite Steel Deck.
1.3.1.11 CSSBI B13-06 Design of Steel Deck Diaphragms – 3rd Edition

1.3.1.12 SDI (Steel Deck Institute) - Design Manual for Composite Decks, Form Decks, Roof Decks, Cellular Metal Floor Deck with Electrical Distribution.

1.3.1.13 SSPC (The Society for Steel Structures Painting Manual. Protective Coatings)

1.3.1.14 ULC (Underwriters Laboratories of Canada)

1.3.1.15 Where there are differences between the specifications and drawings and the codes, standards, or acts, the most stringent shall govern.

1.3.2 Standards referenced by the standards noted above are to apply even if they are not included in the list. Where such references are made, they shall be to the latest edition and revision published.

1.4 QUALIFICATIONS

1.4.1 Organizations and welders undertaking to weld under this contract shall be certified by the Canadian Welding Bureau under the requirements of W47.1 as applicable.

1.4.2 The manufacturer and the steel deck erector shall each demonstrate a minimum of ten (10) years of relevant experience with the specified steel deck systems.

1.4.3 Design calculations shall be carried out by a qualified Professional Engineer licensed in the Province of Alberta, with a minimum of 5 years Canadian experience in the design of steel deck.

1.5 DESIGN

1.5.1 Design steel deck in accordance with the requirements of The Building Code.

1.5.2 The minimum steel core thickness shall be 0.76 mm (0.030").

1.5.3 Design floor deck such that the live load deflection of deck shall not exceed L/360 of the span.

1.5.4 Design roof deck such that the live load deflection of deck shall not exceed L/300 except when deck supports non-structural services or finishes that are identified as being susceptible to damage. In this case, design roof deck such that deflection of deck shall not exceed L/360 of the span.

1.5.5 Design roof deck such that deflection does not exceed L/300 of the span when supporting a 1.3 kN (300 lb) point load acting over a 300 mm (1'-0") strip of deck.

1.5.6 Design deck anchorage to the supporting structure to safely resist the net uplift forces shown. Design anchorages for deck supporting concrete slabs for net uplift during construction.

1.5.7 Wherever structural framing permits, steel deck shall be designed and fabricated to span continuously over at least four supports (three spans).

1.5.8 Determine structural properties of the concrete slab and composite construction in accordance with requirements of The Building Code.

1.5.9 Design and install composite deck and metal edge and closure strips to safely support construction and other loads before the composite action of the deck system takes place, without excessive deflection.
1.5.10 Design framing for openings through the deck up to a maximum width of 300 mm (12") in floor deck and 450 mm (18") in roof deck measured perpendicular to the span of the deck.

1.5.11 Detail metal edge and closure strips to prevent the loss of grout when the deck is concreted.

1.5.12 Headed studs have been designed to ensure composite action between the steel framing members and the slab on deck floor system. The design of these studs has been based on an assumed steel deck profile where the average flute width is at least twice the height of the deck.

1.6 SUBMITTALS

1.6.1 Submit submittals in accordance with Section 01 33 00 – Submittal Procedures.

1.6.2 Sustainable Design Submittals: Coordinate project sustainable design requirements with Section 01 35 31 – LEED® Special Project Procedures.

1.6.3 Shop Drawings

1.6.3.1 Submit shop and erection drawings and load tables for review by the Consultant.

1.6.3.2 Unless noted otherwise, on all shop drawings provide adequate space immediately above the drawings title block for a Consultant’s Shop Drawing review stamp. Where requested by the Consultant, the stamp is to be inserted by this section directly into the shop drawing prior to submission. The stamp shall be positioned in the same location on each shop drawing, and in no case shall the allocated space be less than 63 x 75 mm (2.5 × 3"). Request the details of these requirements from the Consultant no less than 2 weeks before the commencement of shop drawings.

1.6.3.3 Each drawing submitted shall bear the signature and stamp of a qualified Professional Engineer licensed in the Province of Alberta.

1.6.3.4 Reproduction of the structural drawings to serve as shop drawings will be permitted and is subject to a separate agreement between the Consultant and the Trade Contractor. Any costs associated with the preparation of the structural drawings for use by the Construction Manager and Trade Contractor shall be paid for by this section.

1.6.3.5 As a minimum, the shop drawings shall show the following:

1.6.3.5.1 Types of deck and their locations, including the setting out points for the deck;

1.6.3.5.2 Sufficient detail sections showing the deck's orientation to support members to facilitate erection of deck;

1.6.3.5.3 Design loads, including diaphragm forces;

1.6.3.5.4 Connections to supports including welding details and details for pins and screws if appropriate;

1.6.3.5.5 Net uplift pressures, including pressures during construction;
1.6.3.5.6 Openings and their reinforcement, coordinated with the mechanical and electrical Trade Contractor’s sleeving drawings;

1.6.3.5.7 Base steel thickness;

1.6.3.5.8 Surface protective coating;

1.6.3.5.9 Metal edge and closure strips;

1.6.3.5.10 Acoustic details, if applicable;

1.6.3.5.11 Locations of shoring (if required) and the shoring loads imposed on the structures below;

1.6.3.5.12 Locations, size, type, and welding requirements of welded stud shear connectors;

1.6.3.5.13 Diaphragm shear stiffness factor, as required; and

1.6.3.5.14 Areas where insufficient bearing on supporting steel members will be provided due to steel connections, vertical bracing connections or the like. Coordinate with Section 05 12 00 for additional bearing details required in these locations.

1.6.3.6 Provide the inspection company with a copy of each reviewed drawing bearing the Consultant’s shop drawing stamp.

1.6.4 Calculations

1.6.4.1 Submit calculations bearing the seal and signature of the qualified Professional Engineer licensed in the Province of Alberta and such further proof as may be necessary to show that the steel deck and all related accessories conform to the requirements set forth herein.

1.6.5 As-Built Drawings

1.6.5.1 Mark on a complete set of final drawings any changes, additions, or deletions that occurred during construction.

1.6.5.2 For all shop drawings marked "Reviewed as Noted" or "Revise and Resubmit", update and submit a record set of these drawings at the completion of the structural work. Ensure that these drawings reflect the changes and are coordinated with the final drawings noted above.

1.6.6 Mill Test Reports

1.6.6.1 Submit all mill test reports covering chemical and physical properties of materials used in this work a minimum of 4 weeks prior to commencing fabrication.

2 Materials

2.1 STEEL DECK

2.1.1 Sheet Steel: ASTM A653/A653M, Structural Quality; with Z180 (G60) or ZF75(A25) minimum coating for steel deck not considered architecturally exposed to view or weather.
2.1.2 The composite steel deck and concrete slab shall comply with the fire-rating requirements.

2.1.3 Provide steel deck profile with interlocking side joints.

2.1.4 Related Deck Accessories: Metal closure strips, wet concrete stops, cover plates, cant strips.

2.1.5 Stud Shear Connectors: ASTM A108, Grade 1015. Headed studs shall be welded per manufacturer recommendations.

2.1.6 Mechanical Fasteners: Fasteners shall have knurled shank; minimum 12 mm (1/2") diameter steel washers; electroplated zinc coating conforming to ASTM B633, Sc. 1, Type III; meeting CSSBI design requirements, such as Hilti X-EDNK22 THQ12, X-EDN19 THQ12, or X-ENP-19 L15 fasteners. For use on open web steel joists with top flange thicknesses between 3 to 6 mm (1/8" to ¼"), use Hilti X-EDNK22 THQ12 fasteners. For open web steel joists or beams with a top flange thickness of 5 to 10 mm (3/16" to 3/8") use Hilti X-EDN19 THQ12 fasteners. For flanges equal to or greater than 6 mm (1/4"), use Hilti X-ENP-19 L15 fasteners. Verify performance and applicability of application with the manufacturer by performing test fastenings prior to the installation of the deck.

2.1.7 Side Lap Connectors: Sidelap connectors to connect steel deck units at overlaps can consist of Hilti SLC 01 for gauges 18 to 26 or the Hilti SLC 02 for gauges 16 to 22.

2.1.8 Welding Materials: Type required for materials being welded.

2.1.9 Shop and Touch-Up Primer: SSPC-Paint 15 Manufacturer's standard, complying with SSPC-Paint 15.

3 Execution

3.1 INSTALLATION

3.1.1 General

3.1.1.1 Install steel deck to manufacturer's written instructions and to CSSBI SDI Manual requirements.

3.1.1.2 Install steel deck such that it is free of dirt, scale, foreign matter, dents, or deformations. Deck, which is considered architecturally exposed to view, that is dented or deformed is subject to acceptance by the Consultant.

3.1.1.3 Lap ends of deck units not receiving concrete slab a minimum of 50 mm (2") and only over supporting members.

3.1.1.4 Where steel deck spans parallel to beams that are to have studs added to top flange, arrange bottom flutes to be centred over beams. If this is not possible, interrupt decking so that studs can be placed on beams to allow composite action to take place.

3.1.1.5 Bear deck on steel supports with 75 mm (3") minimum bearing. Align and level the deck.

3.1.1.6 Fasten steel deck to supporting members to safely resist the forces shown but with not less than 19 mm (3/4") diameter fusion welds or mechanical fasteners at 300 mm (12") on center at intermediate supports and 19 mm (3/4") diameter fusion welds or mechanical fasteners at 150 mm (6") on
3.1.1.7 Weld to CSA-W59.

3.1.1.8 Mechanically clinch male/female side laps to resist the forces shown but at not more than 600 mm (24") on center maximum for decking thickness less than 20 gauge.

3.1.1.9 Weld male/female side laps to resist the forces shown but at not more than 450 mm (18") on center maximum for decking thickness 20 gauge or thicker.

3.1.1.10 Make fusion welds of deck to supporting members well within bearing width of supporting members.

3.1.2 Openings Through Deck

3.1.2.1 Obtain opening and sleeving information from all Trade Contractors before proceeding with the work. Coordinate with other trades as necessary.

3.1.2.2 Indicate openings and reinforcement for openings on fabrication and erection drawings.

3.1.2.3 Cut openings and reinforce edges as required for pipes, ducts, and the like. The maximum size of an unreinforced opening is 150 mm (6") square or in diameter. Reinforce openings having a dimension over 150 mm (6") but not exceeding 300 mm (12") in floor deck or 450 mm (18") in roof deck. The location of holes through decking shall be to the approval of the Consultant.

3.1.2.4 Where possible, leave deck intact and use block outs to form concrete edges at openings. (Cut deck after concrete has reach a minimum of 70% of its 28 day specified strength.)

3.1.3 Supports from Deck

3.1.3.1 No hangers or brackets supporting mechanical and electrical services, artwork, ceilings, bulkheads, lighting and the like from the roof deck are permitted, unless the deck is designed specifically for the imposed loads.

3.1.4 Welded Stud Shear Connectors

3.1.4.1 Weld headed studs to the supporting structural steel through the steel deck as per the requirements of CSA Standard W59, except where studs are required to be welded to the steel in the shop.

3.1.4.2 Where stud shear connectors are shop welded to supporting steel members, accurately layout and predrill holes in the deck to facilitate installation of the deck in the field. The use of torch cutting of holes is not permitted.

3.1.5 Protection

3.1.5.1 Immediately after any deck which does not receive a concrete slab is permanently secured in place, touch up top surface of deck with primer, where the shop applied coating is damaged during installation or by welding of the deck in place.

3.1.6 Closures
3.1.6.1 Seal off spaces between flutes with closures of neoprene or closed cell expanded p.v.c. at partitions, walls, and other locations indicated. At exterior walls, provide insulated closures.

3.1.6.2 Where steel deck rests on exterior masonry walls, fill web spaces with closures as recommended by manufacturer.

3.1.6.3 Where flutes are at right angles to exterior walls, and deck extends beyond these walls, install interior and exterior closures. In addition, provide roofer with sufficient quantity of glass fibre pads to close off topside flutes directly over face of wall or use closures as recommended by manufacturer.

3.1.6.4 Where flutes run at right angles to interior partitions, fill web spaces as detailed on Architectural drawings.

3.1.6.5 Where flutes are parallel to interior partitions, install steel closure flashings to provide neat juncture between two materials or as recommended by manufacturer. Refer to architectural drawings.

3.1.6.6 Closures are not required between interior partitions and underside of deck in areas having suspended ceiling, unless specified by Architect.

3.1.6.7 Attach metal cell closures at locations required to contain poured concrete.

3.2 QUALITY CONTROL

3.2.1 Implement a system of quality control to ensure that the minimum standards specified herein are attained.

3.2.2 Bring to the attention of the Consultant any defects in the work or departures from the Contract Documents which may occur during construction. The Consultant will decide upon corrective action and give recommendations in writing.

3.2.3 The Consultant's general review during construction and inspection and testing by independent inspection and testing agencies reporting to the Consultant are both undertaken to inform the Owner of the Construction Manager’s performance and shall in no way augment the Construction Manager’s quality control or relieve the Construction Manager of contractual responsibility.

3.3 NOTIFICATION

3.3.1 Prior to commencing significant segments of the work, give the Consultant and Independent Inspection and Testing Companies appropriate notification so as to afford them reasonable opportunity to review the work. Failure to meet this requirement may be cause for the Consultant to classify the work as defective.

3.4 INSPECTION AND TESTING

3.4.1 The Owner will appoint the Independent Inspection and Testing Company to make inspections or perform tests as the Consultant directs. The Independent Inspection and Testing Company shall be responsible only to the Consultant, and shall make only such inspection or tests as the Consultant may direct.

3.4.2 Inspection and testing will include the testing of stud shear connectors.
3.5 DEFECTIVE MATERIALS AND WORK

3.5.1 Where evidence exists that defective work has occurred or that work has been carried out incorporating defective materials, the Consultant may have tests, inspections, or surveys performed such as concrete core strength tests, analytical calculations of structural strength, and the like, in order to help determine whether the work must be replaced. Tests, inspections or surveys or calculations carried out under these circumstances will be made at the Trade Contractor’s expense, regardless of their results, which may be such that, in the Consultant’s opinion, the work may be acceptable.

3.5.2 All testing shall be conducted in accordance with the requirements of The Building Code, except where this would in the Consultant’s opinion cause undue delay or give results not representative of the rejected material in place. In this case, the tests shall be conducted in accordance with the standards given by the Consultant.

3.5.3 Materials or work which fails to meet specified requirements may be rejected by the Consultant whenever found at any time prior to final acceptance of the work regardless of previous inspection. If rejected, defective materials or work shall be removed and replaced or repaired to the satisfaction of the Consultant, promptly, at no expense to the Owner.

End of section
1 General

1.1 SUMMARY

1.1.1 This Section includes requirements for delegated design of wall framing system to resist wind loads and account for building movements in accordance with Section 01 33 50 – Delegated Design Submittals including; but not limited to, the following components:

1.1.1.1 Studs subjected to lateral wind loads
1.1.1.2 Top and bottom tracks
1.1.1.3 Bridging and bracing
1.1.1.4 Top and bottom track connections to main structure, including fabrications to accommodate main structure deflections; top of wall anchor allowing for dead load deflections during construction and live load deflections after construction
1.1.1.5 Head, sill and jamb members at wall openings
1.1.1.6 Framing component connections

1.2 RELATED REQUIREMENTS

1.2.1 Section 01 33 50 – Delegated Design Submittals
1.2.2 Section 05 05 00 – Common Work Results for Metals
1.2.3 Section 06 10 53 – Miscellaneous Rough Carpentry: Miscellaneous wood blocking.
1.2.4 Section 06 16 43 – Gypsum Sheathing
1.2.5 Section 07 52 23 – Cold Adhesive Applied Bituminous Membrane Roofing: Installation of vapour retarding continuity sheets installed as a part of steel framed parapet and curb construction.
1.2.6 Section 08 11 13 – Steel Doors and Frames
1.2.7 Section 08 44 13 – Glazed Aluminum Curtain Walls
1.2.8 Section 09 21 16 – Gypsum Board Assemblies: Non-load bearing interior steel framing.

1.3 DEFINITIONS

1.3.1 Minimum Uncoated Steel Thickness: Minimum uncoated thickness of lightweight steel framing shall be not less than 95% of the thickness used in the design for the framing system:

1.3.1.1 Lesser thicknesses may be permitted at bends arising from the cold forming process.
1.3.1.2 Metal thicknesses listed in this section are minimum uncoated steel thickness; exclusive of any subsequent coatings or treatments.

1.3.2 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.

1.3.3 Letters of Commitment and Compliance: Documents prepared by the delegated design professional engineer as recommended by APEGA's Responsibilities for Engineering Services for Building Projects.
1.4 ADMINISTRATIVE REQUIREMENTS

1.4.1 Coordination: Coordinate work of this Section with work of other sections that may have items supported by or built into wind load bearing steel stud systems, including; but not limited to [masonry connectors], doors, windows, architectural woodwork, pre-manufactured casework, plumbing fixtures, and electrical fixtures and panels.

1.4.2 Pre-Construction Meetings: Arrange for pre-construction meeting in accordance with Section 01 31 19 – Project Meetings with Construction Manager, Trade Contractor, and Consultant to discuss installation requirements and site reviews required by the Consultant and the delegated design professional engineer:

1.4.2.1 Provide minimum 72 hours notice to Consultant before starting work of this Section; increase notice period where time period spans weekends or statutory holidays.

1.4.2.2 Do not conceal wind load bearing steel stud framing system until reviewed by Consultant.

1.5 REFERENCE STANDARDS

1.5.1 American Society of Mechanical Engineers International (ASME):

1.5.1.1 ASME B18 Series Codes and Standards as referenced for specific screws, nuts, bolts and other fasteners

1.5.2 American Society for Testing and Materials (ASTM):

1.5.2.1 ASTM A307-04e1, Carbon Steel Bolts and Studs

1.5.2.2 ASTM A325-10e1, Standard Specification for Structural Bolts, Steel, Heat Treated, 120-105 ksi Minimum Tensile Strength

1.5.2.3 ASTM A653/A653M-11, Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process

1.5.3 Canadian General Standards Board (CGSB):

1.5.3.1 CAN/CGSB 1.181-99, Ready-Mixed Organic Zinc-Rich Coating

1.5.3.2 CAN/CGSB 7.1-98, Lightweight Steel Wall Framing Components

1.5.4 Canadian Sheet Steel Building Institute (CSSBI):

1.5.4.1 CSSBI 51-06, Lightweight Steel Framing Design Manual

1.5.4.2 CSSBI S5-04, Guide Specification for Wind Bearing Steel Studs

1.5.4.3 CSSBI S6-04, Guide Specification for Lightweight Steel Framing

1.5.5 Canadian Standards Association (CSA):

1.5.5.1 CSA A370-04, Connectors for Masonry

1.5.5.2 CAN/CSA S16-01, Limit States Design of Steel Structures

1.5.5.3 CSA S136-12, North American Specification for the Design of Cold-Formed Steel Structural Members and Commentary

1.5.5.4 CSA S304.1-04, Design of Masonry Structures

1.5.5.5 CSA W47.1-09, Certification of Companies for Fusion Welding of Steel

1.5.5.6 CSA W59-03, Welded Steel Construction (Metal Arc Welding)

1.6 SUBMITTALS

1.6.1 Provide required information in accordance with Section 01 33 00 – Submittal Procedures.

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

1.6.2.1 Product Data: Submit product data for mechanical fasteners, indicating sizes, shear, and pull-over loading capacity where applicable. Provide data indicating thickness and type of corrosion protection coating.
1.6.2.2 Shop Drawings: Submit shop drawings clearly indicating all construction details including connections and anchor requirements. Indicate type, size and spacing of fastening devices. Indicate design loads; include seal and signature of a professional engineer registered in the Province of the Work for shop drawings requiring structural design.

1.6.3 Informational Submittals: Provide the following submittals when requested by the Consultant:

1.6.3.1 Certificates: Submit evidence of welder qualifications meeting requirements for work being performed by this Section.

1.6.3.2 Delegated Design Submittals: Provide delegated design in accordance with Section 01 33 50 and Section 05 05 00, for design criteria described in this Section, and as follows:

1.6.3.2.1 Submit delegated design professional engineer's design notes and calculations when requested by the Consultant.

1.6.3.2.2 Submit Letter of Commitment, signed and sealed by professional engineer responsible for work of this Section; professional engineer shall define applicable responsibilities in the completed Letter of Commitment in conjunction with Shop drawings.

1.6.3.2.3 Submit Letter of Compliance, signed and sealed by professional engineer responsible for work of this Section design engineer to certify substantial compliance with the system design before declaration of Substantial Performance for the project.

1.6.4 Sustainable Design Submittals: Coordinate project sustainable design requirements with Section 01 35 31 - LEED Special Project Procedures and Section 01 35 31A - LEED Material Information Sheet for LEED Submittals.

1.7 QUALITY ASSURANCE

1.7.1 Qualifications: Provide proof of qualifications when requested by Consultant:

1.7.1.1 Supplier: Use a manufacture capable of designing, fabricating and erecting of work of this Section in accordance with applicable Building Code and Contract Documents [and is capable of providing delegated design requirements for design, site review and certification of installation].

1.7.1.2 Installer: Use welders certified by the Canadian Welding Bureau in accordance with CSA W47.1 for the type of work being performed; perform welding in accordance with CSA W59 and the requirements listed in Section 05 05 00.

1.8 DELIVERY, STORAGE AND HANDLING

1.8.1 Delivery and Acceptance Requirements: Deliver steel stud framing clearly marked with core steel thickness by embossing, stamping with indelible ink or by colour coding.

1.8.2 Storage and Handling Requirements: Store materials flat, blocked off the ground in a manner to prevent kinking or permanent set; bent, kinked or twisted studs and track will be rejected.

2 Products

2.1 DESIGN CRITERIA

2.1.1 Perform design, fabrication and erection of the work of this Section based on Limit States Design principles using factored loads and resistances, determined in accordance with CSA S136.
2.1.2 Conform to the requirements of indicated fire resistance ratings.

2.1.3 Design wall framing system capable of withstanding design loads within limits and under design loads indicated on Drawings, and as follows:

2.1.3.1 Dead Loads: Weights of materials and construction.

2.1.3.2 Wind Loads: Wind Loads: q50 for deflection and for strength, modified by the appropriate importance factor, exposure, gust effect factors, and pressure coefficients (internal and external) in accordance with commentary "I" of the NBC 2005 structural commentaries.

2.1.3.3 Design framing systems to provide for movement of framing members without damage or overstressing, sheathing failure, connection failure, undue strain on fasteners and anchors, or other detrimental effects when subject to a maximum ambient temperature change of 70°C.

2.1.3.4 Design framing system to maintain clearances at openings, to allow for construction tolerances, and to accommodate live load deflection of primary building structure upward and downward movement of 19 mm; or larger gap as may be required to accommodate structural movement.

2.1.3.5 Design deflection detail so that free floating vertical members are restrained from horizontal movement by means of continuous bridging, nested or boxed tracks, or sliding or flexible web connections.

2.1.3.6 Maximum allowable deflection under q50 sustained wind loading (with the appropriate importance factors for ULS and SLS shall be as follows:

2.1.3.6.1 Behind concrete– stud deflection limited to L/720.
2.1.3.6.2 Behind metal cladding – stud deflection limited to L/360.

2.1.3.7 Allow for movement of the structure; design lightweight steel framing end connections to accommodate floor and roof deflections such that studs are not loaded axially; limit free play and movement in connections perpendicular to the plane of framing to ±0.50 mm relative to the building structure.

2.1.3.8 Design connections between light steel framing members using bolts, welding or sheet metal screws.

2.1.3.9 Design bridging to prevent member rotation and member translation perpendicular to the minor axis, and as follows:

2.1.3.10 Design for secondary stress effects due to torsion between lines of bridging.

2.1.3.11 Design exterior wall framing to accommodate horizontal deflection without allowing for collateral contribution of sheathing materials.[

2.1.3.12 Design bridging at 1530 mm centres maximum, closer spacing may be required by design to satisfy structural requirements; spaced at even intervals over the span of the member.

2.1.4 Stud, sill and top track sizes and thicknesses, and fastening details indicated in this Section and on the Drawings shall be considered as minimums only, spacing indicated as maximum permissible, except where changes are required to meet design criteria, and as follows:

2.1.4.1 Design head, sill and jamb members to frame openings larger than 100 mm in any dimension.

2.1.4.2 Design components or assemblies to accommodate specified tolerances of the structure.

2.1.4.3 Sill and Top Tracks:

2.1.4.3.1 Double track system, outer track flanges with depth to suit vertical deflection and width of studs.

2.1.4.3.2 Sill tracks, minimum 33 mm deep flanges and width of studs.
2.1.4.4 Movement Connection Clips: Purpose made clip designed to allow structural member vertical movement and to transfer wind suction or pressure to structural frame.

2.1.4.5 Maximum design spacing of stud members shall not exceed 406 mm centres.

2.1.4.6 Maximum spacing for top and bottom track connections to the structure shall not exceed 810 mm centres.

2.1.4.7 Minimum design thickness for wall framing members shall be as follows or thicker when required to meet project performance requirements:

2.1.4.7.1 64 mm: 33 (0.84 mm)
2.1.4.7.2 92 mm: 33 (0.84 mm)
2.1.4.7.3 101 mm: 33 (0.84 mm)
2.1.4.7.4 140 mm: 33 (0.84 mm)
2.1.4.7.5 152 mm: 43 (1.09 mm)
2.1.4.7.6 184 mm: 54 (1.37 mm)
2.1.4.7.7 203 mm: 54 (1.37 mm)
2.1.4.7.8 Minimum thickness for walls supporting masonry veneer shall be 54 (1.37 mm) regardless of minimum thickness indicated above, or thicker as required to suit design conditions.

2.1.4.8 Bridging Channel: 1.09 mm minimum
2.1.4.9 Clip Angles: 1.37 mm minimum

2.2 MATERIALS

2.2.1 Wind Bearing Steel Framing Members and Accessories:

2.2.1.1 Steel conforming to CSA S136 and shall be identified as to specification, type grade and mechanical properties; metal core thickness and spacing determined by delegated design professional engineer, hot dipped galvanized steel; roll formed with knurled flanges, and cut-outs for services and bracing

2.2.1.2 Galvanizing conforming to ASTM A653/A653M to a minimum of Z180 for exterior wall assemblies; the Consultant may accept other coatings meeting or exceeding the corrosion protection listed upon written request to the Consultant.

2.2.1.3 Colour Coding: In accordance with Lightweight Steel Framing Manual, published by Canadian Sheet Steel Building Institute.

2.2.2 Fasteners and Welds:

2.2.2.1 Welding materials conforming to CSA W59; electrodes minimum 480 MPa tensile strength

2.2.2.2 Bolts and nuts conforming to ASTM A307 or ASTM A325, with washers and hot-dip galvanized finish.

2.2.2.3 Metal to Metal: Sheet metal screws conforming to ASME 18, with minimum 0.008 mm thick galvanized coating and #8 Ø; self-drilling, self-threading, case hardened type; hex, pan, and low-profile head profile type to suit application; length sufficient to penetrate not less than 3 fully exposed threads beyond joined materials.

2.2.2.4 Metal to Concrete: Drilled insert, minimum 6.4 mm Ø; do not use Powder Actuated Fasteners.

2.2.2.4.1 Basis-of-Design Materials: Hilti Kwik Con

2.2.2.5 Metal to Structural Steel: Secure track to structural steel over 8 mm thickness with proprietary fastening system:

2.2.2.5.1 Acceptable Materials: Hilti DX Fastening System with ENP2-21L15MX.
2.2.2.5.2 Drilled Inserts: Steel, cadmium plated or hot-dip galvanized, sizes as indicated on drawings.

2.2.3 Touch up Paint: Zinc-rich, to CAN/CGSB 1.181M

2.2.4 Moisture Barrier: Insulating moisture resistant 6 mm thick foam strip x width of framing member, length as required:
   2.2.4.1 Basis-of-Design Materials: Dow Ethafoam 222
   2.2.4.2 Thermal Insulation: ASTM C 665, Type I, un-faced mineral-fibre blankets produced by combining glass or slag fibres with thermosetting resins.

3 Execution

3.1 INSPECTION AND PREPARATION
   3.1.1 Confirm that flashings and waterproof membranes provided by other Sections are properly installed to divert moisture to exterior.
   3.1.2 Confirm that door and window frames are placed and securely braced in proper location.

3.2 ERECTION
   3.2.1 Fabrication and erection shall conform to the reviewed shop drawings; modifications required to accommodate on-site conditions, other than minor dimensional changes, shall be resubmitted by the delegated design professional engineer and reviewed with the Consultant for acceptance prior to proceeding with work.
   3.2.2 Provide continuous top and bottom tracks.
   3.2.3 Align exterior wall partition tracks at floor and underside of deck, isolate track from direct contact with concrete using moisture barrier.
   3.2.4 Cut bottom of studs square and set with full contact in bottom track; screw-fasten both flanges to sill track.
   3.2.5 Place studs vertically at not more than 50 mm from abutting walls, and at each side of openings and corners; position studs in tracks at floor and ceiling, unless noted otherwise.
   3.2.6 Cross-brace steel studs as required to provide rigid installation to delegated design engineer instructions; attach studs to lower ceiling track using specified fasteners.
   3.2.7 Cut members using saw or shear; flame cutting is not permitted.
   3.2.8 Provide minimum of three studs at corners; insulate exterior components not accessible from interior using mineral fibre insulation:
      3.2.8.1 Place insulation equal to that specified for the field area of assemblies into non accessible areas such as jamb and header assemblies, corners and wall to roof transitions.
      3.2.8.2 Keep insulation dry after installation. Do not compress insulation.
   3.2.9 Provide cross studs secured to studs, and additional framing as required for support of fixtures mounted to walls.
   3.2.10 Erection tolerances shall be as follows:
      3.2.10.1 Erect steel studding to tolerance of ±3 mm, non cumulative from design spacing. Spacing in any case shall not exceed the requirements of the finishing materials.
      3.2.10.2 Out-of-plumb shall not exceed 1/500 of the member length.
      3.2.10.3 Out-of-straight (camber or sweep) shall not exceed 1/1000 of the member length.
      3.2.10.4 Track camber shall not exceed 1/1000 of member length.
3.2.10.5 Studs shall seat into top and bottom tracks; gap between the end of the stud and the web of the track shall not exceed 4 mm for lightweight steel framing.

3.2.10.6 Distance from centreline of last un-reinforced cut-out to end of framing member shall not be less than 305 mm.

3.2.11 Coordinate simultaneous erection of studs with installation of service lines; align web openings when erecting studs.

3.2.12 Coordinate erection of studs with installation of door/window frames and special supports or anchors for Work specified in other Sections.

3.2.13 Provide two studs extending from floor to ceiling at each side of openings wider than stud centres specified; secure studs together using sheet metal and screw fasteners.

3.2.14 Erect track at head of door openings and sills of sidelight/window openings to accommodate intermediate studs; secure track to studs at each end; install intermediate studs above and below openings in same manner and spacing as wall studs.

3.2.15 Install steel studs or furring channel between studs for attaching electrical and other boxes.

3.2.16 Perform welding in accordance with CSA W59; for material less than 3 mm thick, the effective throats of welds shall not be less than the thickness of the thinnest connect part:

3.2.16.1 Mechanically fasten all members having a thickness of 0.91 mm and less; weld or mechanically fasten members having thicknesses of 1.12 mm and greater.

3.2.17 After erection, refinish damaged finishes, welds, fastener heads and nuts with zinc rich paint, in accordance with paint manufacturer's instructions.

3.3 FIXTURE ATTACHMENT AND ACCESS PANELS

3.3.1 Install all attachments within steel-stud partitions for fixtures being hung from or anchored to such partitions.

3.3.2 Install access doors to electrical or mechanical fixtures supplied under respective Sections.

3.3.3 Rigidly secure frames to furring or framing systems.

3.4 INSPECTION AND CERTIFICATION

3.4.1 The installation of the exterior steel stud walls shall be inspected periodically by the delegated design professional engineer responsible for the component selection and connection designs for conformance to the shop drawings and design intent in accordance with Section 05 05 00 and Section 01 33 50.

3.4.2 Forward copies of inspection reports to Owner, Consultant, and the Trade Contractor responsible for the Work and the Construction Manager.

3.4.3 Prior to declaration of Substantial Performance, delegated design professional engineer shall submit a Letter of Compliance, signed and sealed in accordance with Section 01 33 50 – Delegated Design Submittals.

END OF SECTION
1 General

1.1 SUMMARY
1.1.1 This Section includes requirements for supply and installation of non-ornamental metal fabrications and miscellaneous metals required for installation of structural steel, decking and joist framing, and other structural components.

1.2 RELATED REQUIREMENTS
1.2.1 Section 04 81 00 – Unit Masonry Assemblies: Supply of loose steel lintels.
1.2.2 Section 05 05 00 – Common Work Results for Metals: Qualifications, testing and inspection requirements for this Section and Sustainable Design submittal requirements.
1.2.3 Section 05 05 19 – Common Work Results for Metalwork Finishing
1.2.4 Section 05 12 00 – Structural Steel
1.2.5 Section 05 21 00 – Steel Joist Framing
1.2.6 Section 05 31 00 – Steel Decking
1.2.7 Section 05 41 13 – Wind Load Bearing Steel Stud Framing
1.2.8 Section 05 51 00 – Metal Stairs and Ladders
1.2.9 Section 06 10 53 – Miscellaneous Rough Carpentry: Materials and finishing requirements for data and voice back boards.
1.2.10 Section 08 44 13 – Glazed Aluminum Curtain Wall: Metal fabrications required by curtain wall systems for connections to structural steel and anchorages.
1.2.11 Section 09 21 16 – Gypsum Board Systems: Wall supports for stub walls; placement of reinforcements for support of metal fabrications.
1.2.12 Section 09 91 00 – Painting

1.3 REFERENCE STANDARDS
1.3.1 American Society for Testing of Materials (ASTM):
1.3.1.1 ASTM A27/A27M-05, Standard Specification for Steel Castings, Carbon, for General Application
1.3.1.2 ASTM A47/A47M-99(2009), Ferritic Malleable Iron Castings
1.3.1.3 ASTM A36/A36M-12, Standard Specification for Carbon Structural Steel
1.3.1.4 ASTM A53/A53M-12, Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless
1.3.1.5 ASTM A108-13, Standard Specification for Steel Bar, Carbon and Alloy, Cold-Finished
1.3.1.6 ASTM A123/A123M-13, Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products
1.3.1.7 ASTM A153/A153M-05, Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware
1.3.1.8 ASTM A307-10, Standard Specification for Carbon Steel Bolts and Studs, 60 000 PSI Tensile Strength
1.3.1.9 ASTM A500-10a, Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes
1.3.1.10 ASTM A563-07a, Standard Specification for Carbons and Alloy Steel Nuts
1.3.1.11 ASTM A666-10, Standard Specification for Annealed or Cold-Worked Austenitic Stainless Steel Sheet, Strip, Plate, and Flat Bar
1.3.1.12 ASTM A786/A786M-05(2009), Standard Specification for Hot-Rolled Carbon, Low-Alloy, High-Strength Low-Alloy, and Alloy Steel Floor Plates
1.3.1.13 ASTM A793-96(2014), Standard Specification for Rolled Floor Plate, Stainless Steel
1.3.1.14 ASTM B221-13, Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes
1.3.1.15 ASTM B633-11, Standard Specification for Electrodeposited Coatings of Zinc on Iron and Steel
1.3.1.16 ASTM C1107/C1107M-13, Standard Specification for Packaged Dry, Hydraulic-Cement Grout (Nonshrink)
1.3.1.17 ASTM D1187-97 (2002)e1, Standard Specification for Asphalt-Base Emulsions for Use as Protective Coatings for Metal
1.3.1.18 ASTM E488-96 (2003), Standard Test Methods for Strength of Anchors in Concrete and Masonry Elements
1.3.1.19 ASTM F568M-07, Standard Specification for Carbon and Alloy Steel Externally Threaded Metric Fasteners
1.3.1.20 ASTM F593-13, Standard Specification for Stainless Steel Bolts, Hex Cap Screws, and Studs
1.3.1.21 ASTM F594-09e1, Standard Specification for Stainless Steel Nuts
1.3.1.22 ASTM F1554-07ae1, Standard Specification for Anchor Bolts, Steel, 36, 55, and 105-ksi Yield Strength

1.3.2 Canadian Standards Association (CSA):
1.3.2.1 CSA G40.20-13/G40.21-13, General Requirements for Rolled or Welded Structural Quality Steel Structural Quality Steel
1.3.2.2 CSA W59-03, Welded Steel Construction (Metal Arc Welding) with Update

1.3.3 The National Association of Architectural Metal Manufacturers (NAAMM):
1.3.3.1 AMP 555-92, Code of Standard Practice for Architectural Metal Industry, including Miscellaneous Iron

1.4 ADMINISTRATIVE REQUIREMENTS

1.4.1 Pre-Construction Meetings: Schedule and conduct a pre-installation conference at the project site in accordance with Section 01 31 19 – Project Meetings with Construction Manager, Trade Contractor responsible for fabrication and erection, Trade Contractor responsible for finish painting, and the Consultant to verify project requirements, fabricator's installation instructions and manufacturer's warranty requirements.

1.4.2 Coordination: Coordinate with for requirements affecting this Section and as follows:

1.4.2.1 Anchorages: Provide setting drawings, templates and directions for installing anchorages including sleeves, concrete inserts, anchor bolts, and items with integral anchors that are embedded in concrete or masonry, and deliver to site in time for installation.

1.4.2.2 Priming and Galvanizing: Coordinate priming and galvanizing requirements with Section 05 05 19 for non-architecturally finished components.

1.4.2.3 Architectural Finishing: Coordinate finishing requirements with paint systems specified in Section 09 91 00; failure to apply referenced primer will result in this section removing applied primer and recoating with specified material at no additional cost to Owner or Consultant.

1.5 SUBMITTALS

1.5.1 In addition to submittal items listed in Section 05 05 00, provide required information in accordance with Section 01 33 00 – Submittal Procedures.
1.5.2 Action Submittals: Provide the following submittals before starting any work of this Section:

1.5.2.1 Product Data: Submit product data for the following:
   1.5.2.1.1 Non-slip aggregates and non-slip aggregate surface finishes
   1.5.2.1.2 Grout
   1.5.2.1.3 Fasteners
   1.5.2.1.4 Prefabricated components
   1.5.2.1.5 Paint and coating products

1.5.2.2 Shop Drawings: Submit shop drawings indicating detailed fabrication and erection of each metal fabrication indicated in accordance with NAAMM AMP 555 including; but not limited to plans, elevations, sections, and details of metal fabrications and connections; show anchorage and accessory items.

1.5.3 Informational Submittals: Provide the following submittals when requested by the Consultant:

1.5.3.1 Certificates: Submit certificates for the following:
   1.5.3.1.1 Mill certificates signed by manufacturers of stainless steel sheet certifying that products provided are in accordance with requirements of this Section.
   1.5.3.1.2 Copies of welding certificates for welding procedures and personnel in accordance with Section 05 05 00.

1.5.4 Sustainable Design Submittals: Coordinate project sustainable design requirements with Section 01 35 31 - LEED Special Project Procedures and Section 01 35 31A - LEED Material Information Sheet for LEED Submittals; in addition, provide information for specific requirements listed in Section 05 05 00.

1.6 QUALITY ASSURANCE

1.6.1 Regulatory Requirements: Perform structural welding, use personnel and qualify procedures in accordance with requirements listed in Section 05 05 00.

1.6.2 Qualifications: Provide proof of qualifications when requested by Consultant:
   1.6.2.1 Fabricators: Use fabricator experienced in producing metal fabrications similar to those required for this project and with a record of successful in-service performance with sufficient production capacity to produce required units.
   1.6.2.2 Personnel: Use welders qualified by Canadian Welding Bureau for classification of work being performed that are experienced in type and extent of work required for the project.

1.7 PROJECT CONDITIONS

1.7.1 Site Measurements: Verify dimensions by site measurements before fabrication and indicate measurements on shop drawings where metal fabrications are indicated to fit walls and other construction; coordinate fabrication schedule with construction progress to avoid delaying the Work.

1.7.2 Established Dimensions: Establish dimensions and proceed with fabricating metal fabrications without site measurements where site measurements cannot be made without delaying the Work; coordinate construction to ensure that actual dimensions correspond to established dimensions; allow for trimming and fitting.
2 Products

2.1 SOURCE OF SUPPLY

2.1.1 Steel Shapes and Sections: Sizes and configurations indicated on Drawings are conceptual and may represent materials that are not commonly available under the referenced standards; Consultant will consider substitute materials having similar profiles or meeting different standards provided they meet or exceed the structural requirements of the detailed materials and provided the information is submitted with a request for substitution in accordance with Section 01 62 00 – Product Options.

2.2 MATERIALS

2.2.1 Metal Surfaces: Provide materials with smooth, flat surfaces without blemishes for metal fabrications exposed to view in the completed Work; do not use materials with exposed pitting, seam marks, roller marks, rolled trade names, or roughness.

2.2.2 Ferrous Metals:

2.2.2.1 Steel Plates, Shapes, and Bars: In accordance with CSA G40.20/G40.21, Grade 300W.

2.2.2.1 Hollow Structural Sections: In accordance with CSA G40.20/G40.21, Grade 350W, Class C.

2.2.2.2 Stainless Steel Sheet, Strip, Plate, and Flat Bars: In accordance with ASTM A666, Type 304.

2.2.2.3 Stainless Steel Bars and Shapes: In accordance with ASTM A276, Type 304.

2.2.2.4 Rolled Steel Floor Plate: In accordance with ASTM A786/A786M, rolled from plate meeting requirements for ASTM A36/A36M or ASTM A283/A283M, Grade C or D.

2.2.2.5 Rolled Stainless Steel Floor Plate: In accordance with ASTM A793.

2.2.2.6 Steel Tubing: Cold formed steel tubing in accordance with ASTM A500.

2.2.2.7 Steel Pipe: In accordance with ASTM A53/A53M, standard weight (Schedule 40).

2.2.2.8 Welding Rods and Bare Electrodes: Select according to CWB specifications for metal alloy welded.

2.2.3 Non-Ferrous Metals:

2.2.3.1 Aluminum Extrusions: In accordance with ASTM B221, alloy 6063-T6.

2.2.3.2 Aluminum Alloy Rolled Tread Plate: In accordance with ASTM B632/B632M, alloy 6061-T6.

2.2.4 Cementitious Materials:

2.2.4.1 Grout:

2.2.4.1.1 Non-Shrink, Metallic Grout: Factory packaged ferrous aggregate grout in accordance with ASTM C1107/C1107M, specifically recommended by manufacturer for heavy duty loading applications.

2.2.4.1.2 Non-Shrink, Non-Metallic Grout: Factory packaged, non-staining, non-corrosive, non-gaseous grout in accordance with ASTM C1107/C1107M, specifically recommended by manufacturer for interior and exterior applications.
2.2.5 General Fasteners: Provide Type 304 or 316 stainless steel fasteners for exterior use and zinc plated fasteners with coating in accordance with ASTM B633, Class Fe/Zn 5, where built into exterior walls; select fasteners for type, grade and class required and selected from the following:

2.2.5.1 Bolts and Nuts:

2.2.5.1.1 Bolts: Regular hexagon head bolts, ASTM A307, Grade A or ASTM F568/F568M, Property Class 4

2.2.5.1.2 Nuts and Washers ASTM A563/A563M hex nuts and flat washers

2.2.5.2 Anchor Bolts: ASTM F1554, Grade 36.

2.2.5.3 Machine Screws: ASME B18.6.3/B18.6.7M.

2.2.5.4 Plain Washers: Round, carbon steel, ASME B18.22.1/B18.22M.

2.2.5.5 Lock Washers: Helical, spring type, carbon steel, ASME B18.21.1/B18.21.2M.

2.2.6 Premanufactured Fasteners:

2.2.6.1 Site Installed Headed Stud Shear Connectors: Steel in accordance with ASTM A108, Grades 1010 through 1020 or CSA W59, Appendix H, headed stud type, cold finished carbon steel, with arc shields, size as indicated on drawings:

2.2.6.1.1 Minimum Tensile Stress: 414 MPa

2.2.6.1.2 Minimum Yield Stress: 345 MPa

2.2.6.1.3 Minimum Elongation: 50 mm 20%

2.2.6.1.4 Acceptable Materials:

- Nelson Stud Welding
- Erico International Corporation
- Other acceptable manufacturer

2.2.6.2 Cast-in-Place Anchors in Concrete: Anchors of type indicated below, fabricated from corrosion resistant materials capable of sustaining, without failure, the load imposed within a safety factor of 4, as determined by testing in accordance with ASTM E488, conducted by a qualified independent testing agency and as follows:

2.2.6.2.1 Threaded or wedge type; galvanized ferrous castings, either ASTM A47/A47M malleable iron or ASTM A27/A27M cast steel. Provide bolts, washers, and shims as needed, hot dip galvanized in accordance with ASTM A153/A153M.

2.2.6.3 Expansion Anchors: Anchor bolt and sleeve assembly of material indicated below with capability to sustain, without failure, a load equal to six times the load imposed when installed in unit masonry and equal to four times the load imposed when installed in concrete, as determined by testing in accordance with ASTM E488, conducted by a qualified independent testing agency and as follows:

2.2.6.3.1 Carbon steel components zinc plated in accordance with ASTM B633, Class Fe/Zn 5

2.2.6.3.2 Alloy Group 1 or 2 stainless steel bolts in accordance with ASTM F593/ASTM F738M and nuts in accordance with ASTM F594/ASTM F836M
2.2.7 Finishes: Finish metal fabrications in accordance with NAAMM Metal Finishes Manual for Architectural and Metal Products following recommendations for applying and designating finish after assembly and as follows:

2.2.7.1 Steel and Iron Finishes:

2.2.7.1.1 Galvanizing: Hot dip galvanize items as indicated in accordance with applicable standard following:

- Products: ASTM A123/A123M
- Hardware ASTM A153/A153M

2.2.7.1.2 Preparation for Shop Priming: Prepare uncoated ferrous metal surfaces in accordance with minimum requirements indicated below for SSPC surface preparation specifications and environmental exposure conditions of installed metal fabrications:

- Exteriors SSPC Zone 1B: SSPC-SP6, Commercial Blast Cleaning
- Interiors SSPC Zone 1A: SSPC-SP3, Power Tool Cleaning

2.2.7.2 Stainless Steel Finishes: Remove tool and die marks and stretch lines or blend into finish; grind and polish surfaces to match original finish; passivate and rinse surfaces after polishing, remove embedded foreign matter and leave surfaces chemically clean.

2.2.7.3 Aluminum Finishes: As-Fabricated Finish, AA-M10, mill finish

2.2.7.4 Applied Finishes: Apply finishes to uncoated surfaces of metal fabrications, except items with galvanized finishes and those to be embedded in concrete, sprayed-on fireproofing, or masonry in accordance with SSPC-PA1, Paint Application Specification No. 1; stripe coat corners, crevices, bolts, welds, and sharp edges and as follows:

2.2.7.4.1 Shop Primers: Provide primers that are compatible with paint systems specified in Section 05 05 19 and Section 09 91 00.

2.2.7.4.2 Galvanizing Repair Paint: High zinc dust content paint for regalvanizing welds in steel, in accordance with SSPC-Paint 20, coordinate requirements with Section 05 05 19.

2.2.7.4.3 Bituminous Paint: Cold applied asphalt mastic in accordance with SSPC-Paint 12; except containing no asbestos fibres, or cold applied asphalt emulsion in accordance with ASTM D1187.

2.3 FABRICATION

2.3.1 Shop Fabrication: Shear and punch metals cleanly and accurately, remove burrs; ease exposed edges to a radius of approximately 1 mm; form bent metal corners to smallest radius possible without causing grain separation or otherwise impairing work and as follows:

2.3.1.1 Fabricate joints exposed to weather in a manner to exclude water, or provide weep holes where water may accumulate.

2.3.1.2 Fabricate assemblies exposed to exterior conditions that allow for thermal movement resulting from ambient and surface temperatures by preventing buckling, opening up of joints, overstressing of components, failure of connections, and other detrimental effects.

2.3.1.3 Form exposed work true to line and level with accurate angles and surfaces and straight sharp edges.

2.3.1.4 Remove sharp or rough areas on exposed traffic surfaces.
2.3.2 Shop Welding: Weld corners and seams continuously and as follows:
   2.3.2.1 Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
   2.3.2.2 Obtain fusion without undercut or overlap.
   2.3.2.3 Remove welding flux immediately.
   2.3.2.4 At exposed connections, finish exposed welds and surfaces smooth and blended so no roughness shows after finishing and contour of welded surface matches that of adjacent surface.

2.3.3 Shop Assembly: Pre-assemble items in shop to greatest extent possible to minimize site splicing and assembly and as follows:
   2.3.3.1 Form exposed connections with hairline joints, flush and smooth, using concealed fasteners where possible.
   2.3.3.2 Use exposed fasteners of type indicated; or if not indicated, Phillips flat-head countersunk screws or bolts.
   2.3.3.3 Locate joints where least conspicuous.
   2.3.3.4 Disassemble units only as necessary for shipping and handling limitations.
   2.3.3.5 Use connections that maintain structural value of joined pieces.
   2.3.3.6 Clearly mark units for reassembly and coordinated installation.

2.3.4 Anchorage Fabrication: Fabricate and space anchoring devices to secure metal fabrications rigidly in place and to support required loads; provide for anchorage of type indicated and suitable for supporting structure, and as follows:
   2.3.4.1 Cut, reinforce, drill, and tap metal fabrications as indicated to receive finish hardware, screws, and similar items.

3 Execution

3.1 INSTALLATION

3.1.1 Fastening to In-Place Construction: Provide anchorage devices and fasteners where necessary for securing metal fabrications to in-place construction. Include threaded fasteners for concrete and masonry inserts, toggle bolts, through bolts, lag bolts, wood screws, and other connectors.

3.1.2 Cutting, Fitting, and Placement: Perform cutting, drilling, and fitting required for installing metal fabrications. Set metal fabrications accurately in location, alignment, and elevation; with edges and surfaces level, plumb, true, and free of rack; and measured from established lines and levels and as follows:
   3.1.2.1 Provide temporary bracing or anchors in formwork for items that are to be built into concrete, masonry, or similar construction.
   3.1.2.2 Fit exposed connections accurately together to form hairline joints. Weld connections that are not to be left as exposed joints but cannot be shop welded because of shipping size limitations.

3.1.3 Site Welding: Perform welding work in accordance with CSA W59; do not weld, cut or abrade surfaces of exterior units that have been hot dip galvanized after fabrication and are for bolted or screwed site connections and as follows:
   3.1.3.1 Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
   3.1.3.2 Obtain fusion without undercut or overlap.
   3.1.3.3 Remove welding flux immediately.
   3.1.3.4 At exposed connections, finish exposed welds and surfaces smooth and blended so no roughness shows after finishing and contour of welded surface matches that of adjacent surface.
3.1.4 Corrosion Protection: Coat concealed surfaces of aluminum that will come into contact with grout, concrete, masonry, wood, or dissimilar metals with bituminous paint applied to a high build thickness of 1.5 to 2 mm.

3.2 ADJUSTING AND CLEANING

3.2.1 Touch-Up of Shop Applied Primer: Immediately after erection, clean site welds, bolted connections, and abraded areas of shop coatings, and recoat exposed areas using same material as used for shop priming in accordance with SSPC-PA1 for touching up shop coated surfaces; apply by brush or spray to a minimum 0.05 mm dry film thickness.

3.2.2 Galvanized Surfaces: Clean site welds, bolted connections, and abraded areas and repair galvanizing in accordance with ASTM A780.

3.3 SCHEDULE OF COMPONENTS

3.3.1 The following listing of metal fabrications is provided by the Consultant for the convenience of the Construction Manager every attempt has been made to provide a complete list metal fabrications; however, it and is not intended to be comprehensive listing, which is the Construction Manager’s responsibility; list of metal fabrications includes; but is not limited to, the following:

3.3.1.1 Loose Bearing and Levelling Plates: Provide plates for steel items bearing on masonry or concrete construction; drill plates to receive anchor bolts and for grouting; galvanize plates after fabrication.

3.3.1.2 Loose SteelLintels: Steel angles and shapes of size indicated for openings and recesses in masonry walls and partitions; galvanize where located in exterior walls; weld members together to form a single unit where required; size loose lintels to provide bearing length at each side of openings equal to 1/12 of clear span, but not less than 200 mm, sized as follows:

<table>
<thead>
<tr>
<th>Span (mm)</th>
<th>75 mm Masonry</th>
<th>90 mm Masonry</th>
</tr>
</thead>
<tbody>
<tr>
<td>1000 mm</td>
<td>L76 X 76 X 4.8</td>
<td>See Below</td>
</tr>
<tr>
<td>2000 mm</td>
<td>L76 X 76 X 6.4</td>
<td>L89 X 89 X 6.4</td>
</tr>
<tr>
<td>3000 mm</td>
<td>L127 X 76 X 7.9 LLV</td>
<td>L127 X 89 X 9.5 LLV</td>
</tr>
</tbody>
</table>

3.3.1.3 Shelf Angles: Steel angles with horizontally slotted holes to receive 19 mm bolts, spaced not more than 150 mm from ends and 610 mm O/C, provide vertical channel brackets to support angles from backup masonry and concrete; align expansion joints in angles to coincide with control and expansion joints in cavity wall exterior wythe; galvanize where located in exterior walls.

3.3.1.4 Miscellaneous Framing and Supports: Structural steel shapes, plates, and bars of welded construction; galvanize where located in exterior construction; fabricated to sizes, shapes, and profiles necessary to receive adjacent construction retained by framing and supports; cut, drill, and tap units to receive hardware, hangers, and similar items including but not limited to the following:

3.3.1.4.1 Support angles for elevator door sills
3.3.1.4.2 Elevator machine beams
3.3.1.4.3 Steel framing and supports for overhead doors
3.3.1.4.4 Steel angle frame adjacent to dock leveller for support of dock bumpers
3.3.1.4.5 Steel framing and supports for mechanical and electrical equipment
3.3.1.4.6 Steel framing and supports for applications where framing and supports are not specified in other Sections
3.3.1.4.7 Steel edgings to concrete slabs
3.3.1.4.8 Loading dock edge angles
3.3.1.4.9 Miscellaneous steel trim
3.3.1.4.10 Steel floor plate and supports
3.3.1.4.11 Theatre seating angle framing

END OF SECTION
1 General

1.1 SUMMARY

1.1.1 This Section includes requirements for supply and installation of decorative formed metal fabrications for metal solar fin applications.

1.2 RELATED REQUIREMENTS

1.2.1 Section 05 05 00 – Common Work Results for Metals: Qualifications, testing and inspection requirements for this Section.

1.2.2 Section 05 05 19 – Common Work Results for Metalwork Finishing

1.2.3 Section 08 44 13 – Glazed Aluminum Curtain Walls

1.3 DEFINITIONS

1.3.1 Site Dimensions: Actual dimensions measured on site and used by fabricator to construct required assemblies.

1.3.2 Established Dimensions: Dimensions derived from drawings or that can be reasonably determined from adjacent construction where actual dimensions required by components fabricated in this section are not available; dimensions shall have suitable tolerances so that assemblies can be adjusted on site to fit actual Site dimensions.

1.4 REFERENCE STANDARDS

1.4.1 American Architectural Manufacturer’s Association (AAMA):

1.4.1.1 AAMA 2605-02, Voluntary Specification, Performance Requirements and Test Procedures for Superior Performance Organic Coating on Aluminum Extrusions and Panels

1.4.2 Canadian Standards Association (CSA):

1.4.2.1 CSA G40.20-13/G40.21-13, General Requirements for Rolled or Welded Structural Quality Steel Structural Quality Steel

1.4.2.2 CSA W47.1-09, Certification of Companies for Fusion Welding of Steel

1.4.2.3 CSA W59-03, Welded Steel Construction (Metal Arc Welding) with Update

1.4.2.4 CSA W55.3-1965 (R2003), Resistance Welding Qualification Code for Fabricators of Structural Members Used in Buildings

1.4.3 The National Association of Architectural Metal Manufacturers (NAAMM):

1.4.3.1 AMP 555-92, Code of Standard Practice for Architectural Metal Industry, including Miscellaneous Iron
1.5 ADMINISTRATIVE REQUIREMENTS

1.5.1 Pre-Construction Meetings: Schedule and conduct a pre-installation conference at the project site in accordance with Section 01 31 19 – Project Meetings with Construction Manager, Subcontractor responsible for fabrication and erection, Subcontractor responsible for finish painting, and the Consultant:

1.5.1.1 Agenda for meeting shall include; but not limited to, verifying project requirements, fabricator’s installation instructions and manufacturer's warranty requirements.

1.6 SUBMITTALS

1.6.1 In addition to submittal items listed in Section 05 05 00, submit in accordance with Section 01 33 00 – Submittal Procedures.

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

1.6.2.1 Product Data: Submit product data for products used in metal fabrications including; but not limited to finish coats and fasteners.

1.6.2.2 Shop Drawings: Submit detailed shop and erection drawings of each decorative formed metal fabrication including plans, elevations, sections, and details of ornamental metal fabrications and their connections and as follows:

1.6.2.2.1 Show anchorage and accessory items.

1.6.2.2.2 Submit shop drawings stamped by a structural professional engineer, licensed in the province of the work for load bearing ornamental metal fabrications.

1.6.2.3 Samples for Verification: Submit samples for each specified finish required for Consultant's verification:

1.6.2.3.1 Submit two (2) 600 mm x 600 mm sheet of each specified metal finish showing relevant exposed connections.

1.6.3 Informational Submittals: Provide the following submittals when requested by the Consultant:

1.6.3.1 Welding Certificates: Submit copies of welder certificates signed by Contractor certifying that welders are certified and have the necessary experience to complete work specified in this Section.

1.6.3.2 Submit qualification data for ornamental fabrication firm demonstrating their capabilities and experience.

1.6.4 Sustainable Design Submittals: Coordinate project sustainable design requirements with Section 01 35 31 - LEED Special Project Procedures and Section 01 35 31A - LEED Material Information Sheet for LEED Submittals.

1.7 PROJECT CLOSEOUT SUBMISSIONS

1.7.1 Maintenance Materials: Provide extra materials described below that match products installed and that are packaged with protective covering for storage and identified with labels describing contents:

1.7.1.1 Include mounting and accessory components; replacement materials shall be from same production run as installed units.
1.8 QUALITY ASSURANCE

1.8.1 Qualifications: Provide proof of qualifications when requested by Consultant:

1.8.1.1 Fabricator: Use ornamental metal fabricators experienced in successfully producing ornamental metal fabrications similar to those indicated for the Project, with sufficient production capacity to produce required units without causing delay in the work.

1.8.1.2 Materials: Use only materials free of lead and asbestos fibres, or other materials deleterious to the environment or public health.

1.9 MOCK-UPS

1.9.1 Provide required Mock-ups in accordance with Section 01 45 00 – Quality Control:

1.9.1.1 Construct mock-up as directed by Consultant and Owner of specified metal finish and accessories indicated to demonstrate aesthetic and qualities of specified materials and execution, and as follows:

1.9.1.1.1 Consultant will require modifications pertaining to aesthetics and placement of components that interfere with other materials or fixtures.

1.9.1.1.2 When identified modifications to the mock-up are completed, reviewed, and accepted by the Consultant, they will form the standard of acceptance for the remainder of the Work.

1.9.1.2 Notify Consultant seven (7) days in advance of the dates and times when mock-ups will be constructed.

1.9.1.3 Obtain Consultant's acceptance of mock-ups before proceeding with final unit of Work.

1.9.1.4 Maintain mock-ups during construction in an undisturbed condition as a standard for judging the completed Work. When directed, demolish and remove mock-ups from Project site.

1.9.1.5 Accepted mock-ups in an undisturbed condition at the time of Substantial Performance may become part of the completed Work.

1.10 DELIVERY, STORAGE, AND HANDLING

1.10.1 Delivery and Acceptance Requirements: Deliver materials to the job site in good condition and properly protected against damage to finished surfaces.

1.10.2 Storage and Handling Requirements: Storage on Site: Store materials in a location and in a manner to avoid damage:

1.10.2.1 Store metal components and materials in a clean, dry location.

1.10.2.2 Cover with waterproof paper, tarpaulin or polyethylene sheeting in a manner that will permit circulation of air inside the cover.

1.10.2.3 Keep handling on-site to a minimum.

1.10.2.4 Exercise care to avoid damage to finishes of material.

1.11 SITE CONDITIONS

1.11.1 Site Measurements: Verify dimensions by Site measurements before fabrication and indicate measurements on shop drawings where metal fabrications are indicated to fit walls and other construction; coordinate fabrication schedule with construction progress to avoid delaying the Work.
1.11.2 Established Dimensions: Establish dimensions and proceed with fabricating metal fabrications without Site measurements where Site measurements cannot be made without delaying the Work; coordinate construction to ensure that actual dimensions correspond to established dimensions; allow for trimming and fitting.

1.12 WARRANTY

1.12.1 Special Finish Warranty: Submit a written warranty, signed by manufacturer, covering failure of the factory-applied exterior finish on metal panels within the specified warranty period and agreeing to repair finish or replace panels that show evidence of finish deterioration. Deterioration of finish includes, but is not limited to, colour fade, chalking, cracking, peeling, and loss of film integrity for a period of 20 years from date of Substantial Performance.

2 Products

2.1 CUSTOM DECORATIVE METAL FINS

2.1.1 Structural Sections: In accordance with CSA G40.20/G40.21, Grade 350W, Class C and as follows:

2.1.1.1 East Wall Elevation:

2.1.1.1.1 Nominal 38 mm x 450 mm at mullion grids and mid span of panel
2.1.1.1.2 Location: As indicated on Drawing A4.12

2.1.1.2 West Wall Elevation:

2.1.1.2.1 Nominal 38 mm x 250 mm at mullion grids
2.1.1.2.2 Location: As indicated on Drawing A4.12

2.2 FINISH

2.2.1 Polyester TGIC Free Coating: Polyester powder coating meeting requirements of AAMA 2604 and having proven gloss and colour retention, weather resistance and resistance to chalking as follows:

2.2.1.1 Steel Surface Preparation: Blast Cleaning
2.2.1.2 Stripe Coating: Strip coat edges and build up thickness before applying finish coatings
2.2.1.3 Finish: Smooth
2.2.1.4 Gloss: Semi-Gloss
2.2.1.5 Colour: Custom colour to match ‘Bright White – UC55026’
2.2.1.6 Basis-of-Design Materials: Tigerlac Super Durable Series 58

2.3 FABRICATION

2.3.1 Custom Fabrication: Form metal fabrications from materials of size, thickness, and shapes indicated but not less than that needed to comply with performance requirements. Work to dimensions indicated or on approved shop drawings, using proven details of fabrication and support. Use type of materials indicated or specified for various components of each metal fabrication and as follows:

2.3.1.1 Fabricate work square, true, straight and accurate to required size, with joints closely fitted and properly secured.
2.3.1.2 Shear and punch metals cleanly and accurately; remove burrs.
2.3.1.3 Ease exposed edges to a radius of approximately 0.8 mm; form bent metal corners to smallest radius possible without causing grain separation or otherwise impairing work.

2.3.1.4 Provide for anchorage of type indicated; coordinate with supporting structure. Fabricate and space anchoring devices to provide adequate support for intended use.

2.3.2 Shop Assembly: Preassemble items in shop to greatest extent possible to minimize site splicing and assembly; disassemble units only as necessary for shipping and handling limitations; use connections that maintain structural value of joined pieces; clearly mark units for reassembly and coordinated installation and as follows:

2.3.2.1 Cut, reinforce, drill and tap miscellaneous metal work as indicated to receive finish hardware, screws, and similar items.

2.3.2.2 Accurately form connections with exposed faces flush; mitres and joints tight.

2.3.2.3 Fabricate joints that will be exposed to weather in a manner to exclude water, or provide weep holes where water may accumulate.

2.3.3 Fasteners: Supply components required for anchorage of fabrications; fabricate anchors and related components of same material and finish as fabrication, except where specifically noted otherwise. Hand items over for casting into concrete or building into masonry to appropriate trades together with setting templates. Refer to details for type and location. Fastener finish to match finish colour.

3 Execution

3.1 EXAMINATION

3.1.1 Verify that Site conditions are acceptable and are ready to receive work; starting work of this Section will indicate acceptance of conditions.

3.2 INSTALLATION

3.2.1 Install material and products in accordance with approved shop drawings, and manufacturer’s specifications and guidelines.

3.2.2 Perform cutting, drilling, and fitting required for installation of miscellaneous metal fabrications; set metal fabrication accurately in location, alignment, and elevation; with edges and surfaces level, plumb, true, and free of rack; and measured from established lines and levels.

3.2.3 Erect work square, plumb, straight, and true, accurately fitted, with tight joints and intersections, and free from distortion or defects detrimental to appearance or performance.

3.2.4 Supply and install suitable means of anchorage, such as dowels, anchor clips, bar anchors, expansion bolts and shields, and toggles.

3.2.5 Exposed fastening devices to match finish and be compatible with material through which they pass.

3.2.6 Provide components, together with setting templates, for building by other trades in accordance with shop drawings and schedule.
3.3 CLOSEOUT ACTIVITIES

3.3.1 Cleaning: Wash finished surfaces thoroughly using clean water and soap; rinse with clean water as installation is completed as directed by manufacturer and as follows:

3.3.1.1 Do not use acid solution, steel wool, or other harsh abrasives.

3.3.2 Repair of Defective Work: Remove stained or otherwise defective work and replace with material that meets specification requirements.

END OF SECTION
1 General

1.1 SUMMARY
1.1.1 This section includes requirements for supply and installation of dimensional lumber for miscellaneous blocking, sheathing, plywood backing panels and roof curb framing and blocking.

1.2 RELATED REQUIREMENTS
1.2.1 Section 05 41 13 – Wind Load Bearing Metal Studs
1.2.2 Section 07 62 00 – Sheet Metal Flashing and Trim: Requirements blocking and support of sheet metal flashings and trims.
1.2.3 Division 26 - Electrical: Requirements for plywood backboards.
1.2.4 Division 27 - Communications: Requirements for telecommunications and data panel boards.

1.3 REFERENCE STANDARDS
1.3.1 American Wood Protection Association (AWPA):
1.3.1.1 AWPA Book of Standards, 2012

1.3.2 Canadian Standards Association (CSA):
1.3.2.1 CSA B111-1974 (R2003), Wire Nails, Spikes and Staples
1.3.2.2 CAN/CSA O121-08, Douglas Fir Plywood
1.3.2.3 CAN/CSA O141-05 (R2009), Softwood Lumber
1.3.2.4 CAN/CSA O151-09, Canadian Softwood Plywood
1.3.2.5 CSA O325-07, Construction Sheathing
1.3.2.6 CSA O437 Series 93 (R2006) OSB and Waferboard

1.3.3 National Lumber Grading Authority (NLGA):
1.3.3.1 NLGA Standard Grading Rules for Canadian Lumber, 2010

1.4 SUBMITTALS
1.4.1 Provide required information in accordance with Section 01 33 00 – Submittal Procedures.

1.4.2 Action Submittals: Provide the following submittals before starting any work of this Section:
1.4.2.1 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.

1.4.3 Sustainable Design Submittals: Coordinate project sustainable design requirements with Section 01 35 31 - LEED Special Project Procedures and Section 01 35 31A - LEED Material Information Sheet for LEED Submittals.

1.5 DELIVERY, STORAGE AND HANDLING
1.5.1 Delivery and Acceptance Requirements: Protect materials from weather in transit and on the jobsite

1.5.2 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:
1.5.2.1 Protect edges and corners of sheet materials from damage during handling and storage.
1.5.2.2 Do not store seasoned materials under conditions that will cause moisture content to increase.
1.5.2.3 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

2.1.1 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.

2.1.2 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.

2.1.3 Volatile Organic Compound Emissions: Use adhesives in composite lumber and panel products that have no added urea-formaldehyde as required by referenced LEED® submittal requirements and that are not volatile at normal occupied building temperature conditions.

2.1.4 Certified Wood: Provide a minimum of 50% by cost of wood based materials that are produced from wood obtained from forests certified by Forest Stewardship Council (FSC).

2.2 MATERIALS

2.2.1 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.

2.2.2 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:

2.2.2.1 Plywood: Exterior Rated, Sheathing Grade square edged Douglas Fir or Canadian Softwood plywood meeting requirements of CSA O121 or CSA O151.

2.2.2.2 Span Rated OSB: Exterior Rated, Sheathing Grade, oriented strand board or wafer board meeting requirements of CSA O437 SR 32/16.

2.2.3 Pressure Preservative Treated Lumber: Lumber graded as described above for Miscellaneous Framing and stamped for preservative retention in accordance standards listed in this Section in accordance with CAN/CSA O80.20M and AWPA U1; use only material having radius edges; minimum 6 mm and that is kiln dried to 19% moisture content or less after treatment.

2.2.4 Pressure Preservative Treated Plywood: Treated in accordance with CAN/CSA O80.9M using waterborne preservative to obtain minimum net retention of 4 kg/m³ of wood; use only plywood or laminated materials manufactured with exterior grade adhesives meeting requirements of CSA O121 or CSA O151; kiln dry plywood to moisture content of 15% or less after treatment.

2.3 ACCESSORIES

2.3.1 Site Applied Wood Preservative: Treatment manufacturer’s required preservative wood treatment for touching up and repairing wood products, meeting requirements of CSA O80 series of standards, compatible with pressure preservative treated materials.
2.3.2 Nails, Brads and Staples: Steel nails meeting requirements of CSA B111, length to penetrate connecting solid wood materials and as follows:

2.3.2.1 Exterior Work: Hot dipped galvanized
2.3.2.2 Interior High Humidity Work: Hot dipped galvanized
2.3.2.3 Interior Work: Electroplated zinc plated or cadmium plated
2.3.2.4 Pressure Treated Materials: Stainless steel

2.3.3 Rough Hardware (Bolts, Nuts and Washers): Provide fasteners of size and type required for installation and as follows:

2.3.3.1 Ground Contact Materials: Stainless steel
2.3.3.2 Exterior Work: Hot dipped galvanized
2.3.3.3 Interior High Humidity Work: Hot dipped galvanized
2.3.3.4 Interior Work: Electroplated zinc plated or cadmium plated
2.3.3.5 Pressure Treated Materials: Stainless steel

2.3.4 Wood Screws: Steel screws meeting requirements of ASME B18.6.1 and as follows:

2.3.4.1 Exterior Work: Galvanized, ceramic coated or stainless steel
2.3.4.2 Interior Work: Galvanized

2.3.5 Screws for Fastening to Cold Formed Metal Framing: Steel screws meeting requirements of ASTM C 954, except with wafer heads and reamer wings, length as recommended by screw manufacturer for material being fastened.

2.3.6 Fire Rated Intumescent Coating: Refer to Section 07 81 23.

2.3.7 General Purpose Adhesives: Gun grade, cartridge loaded adhesives meeting requirements of GS-36 for Commercial Adhesive, South Coast Air Quality Management District Rule 1168 and meeting requirements of CSA O112 having maximum VOC content of 70 g/L

3 Execution

3.1 INSTALLATION

3.1.1 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.

3.1.2 Roof Parapets, and Plates: Construct wooden roof curbs around openings in the roof for vents, ducts, and other penetrations, for parapets and edge blocking using pressure preservative treated wood and as follows:

3.1.2.1 Provide continuous wood backing for flashings.
3.1.2.2 Provide solid wood or plywood sheathing and backing to receive membrane and metal flashings, conforming to ARCA Manual; fasten plywood sheathing securely to walls of parapets using mechanical fasteners; nails are not acceptable.
3.1.2.3 Construct framing and blocking for membrane control joints conforming to ARCA Manual.

3.1.3 Pressure Preservative Treated Wood: Install pressure preservative treated wood in accordance with AWPA M4.
3.1.4 Telecommunications and Data Panel Boards: Install 19 mm DFP G1S plywood on all walls in telephone and data rooms receiving wiring and equipment; minimum 1220 mm x 2440 mm panels on periphery walls over 300 mm wide, mounted 150 mm off of finished floor; coordinate installation and locations with Division 26 and Division 27 and as follows:

3.1.4.1 Paint panels with 2 coats of light coloured fire retardant paint finish as specified in Section 07 81 23; coat all sides of panels (back, front and sides) to meet the intent of fire rated panel requirements listed in CSA T530 and ANSI/TIA/EIA 569-B requirements.

3.1.5 Site Waste Reduction and Management: Select lumber sizes to minimize waste, reuse scrap lumber to the greatest extent possible and as follows:

3.1.5.1 Use scrap lumber for non-critical locations such as shims, bracing and blocking.

3.1.5.2 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.

3.1.5.3 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.

3.1.5.4 Do not burn waste lumber on site.

END OF SECTION
1 General

1.1 SUMMARY

1.1.1 This section includes administrative and procedural guidelines and procedures for constructing an airtight Building Envelope that controls infiltration and exfiltration of air and moisture in accordance with the Building Code.

1.1.2 Successful installation of the Building Envelope is dependent on single source responsibility by using either a single Building Envelope Trade Contractor responsible for complete envelope installation; or by the Construction Manager taking on single source responsibility by assigning several Building Envelope Trade Contractors coordinated by the Construction Manager, and that can achieved by the following:

1.1.2.1 Coordination between methods for installation; material compatibility; transitioning or joining to adjacent materials; modifying or otherwise affecting the installed Building Envelope including scheduling and sequencing of the Work.

1.1.2.2 Preconstruction meetings, mock-ups and sample installations to confirm, inspect, test and other related actions including reviews and inspections performed by independent agencies, and Authorities Having Jurisdiction; they do not include contract enforcement activities performed by the Consultant.

1.1.2.3 Activities taken on by the Construction Manager as a part of Durable Building LEED® credits identified in Section 01 45 26.23 – Site Quality Control Procedures: Durable Building Quality Management Program.

1.2 RELATED REQUIREMENTS

1.2.1 Section 07 08 15 – Building Envelope Inspection and Testing: Inspection and testing procedures by third party agencies appointed by the Owner.

1.2.2 Section 07 25 13 – Air and Vapour Membranes

1.2.3 Section 07 52 23 – Cold Adhesive Applied Bituminous Membrane Roofing

1.2.4 Section 07 92 00 – Joint Sealants

1.2.5 Section 08 11 13 – Steel Doors and Frames

1.2.6 Section 08 44 13 – Glazed Aluminum Curtain Walls

1.2.7 Section 08 63 00 – Metal Framed Skylights

1.3 DEFINITIONS

1.3.1 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.

1.3.2 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.

1.3.3 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.
1.3.4 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:

1.3.4.1 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.

1.3.4.2 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.

1.3.4.3 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.

1.3.4.4 Units of Measure: 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:

<table>
<thead>
<tr>
<th>Multiply</th>
<th>By</th>
<th>To Obtain (same test condition)</th>
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<tbody>
<tr>
<td>Water Vapour Transmission Rate (WVT)</td>
<td></td>
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</tr>
<tr>
<td>ng/h•m²</td>
<td>1.43</td>
<td>grains/h•ft²</td>
</tr>
<tr>
<td>grains/h•ft²</td>
<td>0.697</td>
<td>ng/h•m²</td>
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<tr>
<td>Permeance</td>
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<tr>
<td>0.0175</td>
<td>1 Perm (inch-pound)</td>
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</tr>
<tr>
<td>1 Perm (inch-pound)</td>
<td>57.2</td>
<td>ng/Pa•s•m²</td>
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<tr>
<td>Permeability</td>
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<tr>
<td>6.88 X 10⁻⁸</td>
<td>1 Perm inch</td>
<td></td>
</tr>
<tr>
<td>1 Perm inch</td>
<td>1.45 X 10⁻⁹</td>
<td>ng/Pa•s•m</td>
</tr>
</tbody>
</table>

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 REFERENCE STANDARDS

1.4.1 American Society for Testing and Materials (ASTM):

1.4.1.1 ASTM E96/E96M-12, Standard Test Methods for Water Vapor Transmission of Materials

1.4.1.2 ASTM E1105-00 (2008), Standard Test Method for Field Determination of Water Penetration of Installed Exterior Windows, Skylights, Doors, and Curtain Walls, by Uniform or Cyclic Static Air Pressure Difference

1.4.1.3 ASTM E1186-03 (2009), Standard Practices for Air Leakage Site Detection in Building Envelopes and Air Barrier Systems

1.4.1.4 ASTM E1677-11, Standard Specification for an Air Barrier (AB) Material or System for Low-Rise Framed Building Walls

1.4.1.5 ASTM E2178-11, Standard Test Method for Air Permeance of Building Materials

1.5 ADMINISTRATIVE REQUIREMENTS

1.5.1 Coordination: Successful implementation of Building Envelope requires input and coordination from all project participants as follows:
1.5.1.1 Consultant: Consultant provides specifications that describe the performance requirements of the Building Envelope and quality of materials and details indicating configuration of the various Building Envelope components necessary to achieve a continuous Building Envelope.

1.5.1.2 Owner’s Inspection Agency: Building Envelope Inspector provides site specific recommendations and corrections to deficient materials or workmanship, and records observations, recommendations and corrections on a timely basis.

1.5.1.3 Building Envelope Trade Contractor: Installing Trade Contractor submit additional information including product data indicating actual materials used, additional drawings or documentation that may be required to confirm constructability, participate in sample and mock-up construction and implement corrective actions recommended by Building Envelope Inspector and directed by Consultant.

1.5.1.4 Construction Manager: Construction Manager prepares or adds content to their quality management program that includes construction actions that monitor installation of Building Envelope and methods to ensure that corrective actions recommended by Building Envelope Inspector and directed by Consultant are implemented.

1.5.1.5 Mock-Up: Coordinate and arrange for review of full-size mock-up of wall assembly, door and window components and transition membranes described in this Section with Building Envelope Inspector specified in Section 07 08 15.

1.5.1.6 Commissioning: Building Envelope inspection and testing forming a part of the project commissioning process in accordance with Division 01 – General Commissioning Requirements and as described by Section 07 08 15.

1.5.2 Pre-Construction Meetings: Schedule meetings attended by Construction Manager, Building Envelope Trade Contractors, Consultant, Inspection Agency and Owner in accordance with Section 01 31 19 – Project Meetings prior to installation of each Building Envelope component or phase of construction to verify construction methods for controlling air leakage into or out of conditioned spaces including the following:

1.5.2.1 Relationship of LEED® Building Durability Credit RP1 with regards to cooperation between individual Building Envelope Trade Contractors and Building Envelope Commissioning specified in Section 01 45 26.23 – Site Quality Control Procedures: Durable Building Quality Management Program.

1.5.2.2 Importance of continuity of air barrier and vapour retarder system components with all joints and penetrations sealed.

1.5.2.3 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.

1.5.2.4 Requirements for air barrier and vapour retarder system components and physical connection between the following assemblies:

1.5.2.4.1 Foundation and walls
1.5.2.4.2 Walls to windows and doors
1.5.2.4.3 Different wall systems
1.5.2.4.4 Wall and roof transition
1.5.2.4.5 Wall and roof over unconditioned space
1.5.2.4.6 Walls, floor and roof across construction, control and expansion joints
1.5.2.4.7 Walls, floors and roof to utility, pipe and duct penetrations
1.5.2.4.8 Building assemblies having different interior environments
1.5.2.5 Requirements for best practices relating to workmanship and installation processes as follows:

1.5.2.5.1 Methods for making penetrations to air barrier and vapour retarder systems vapour tight, watertight and airtight.
1.5.2.5.2 Installation follow-up procedures to reduce or eliminate installation deficiencies
1.5.2.5.3 Sequence of work and confirmation of compatibility of materials that lap or join dissimilar components
1.5.2.5.4 Use of trained installers for critical components

1.6 QUALITY ASSURANCE

1.6.1 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.

1.6.2 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.

1.6.3 Provide quality assurance procedures, testing and verification required to install Building Envelope as follows:

1.6.3.1 Include costs for Construction Manager’s quality assurance program as a part of the Contract Price.
1.6.3.2 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.

1.7 QUALITY CONTROL

1.7.1 Owner will pay for inspection and testing services performed by an independent agency to verify compliance with specified requirements specified in accordance with Section 07 08 15; testing services performed by the Owner do not relieve Trade Contractor of responsibility for compliance with Contract Document requirements.

1.7.2 Inspection agency will provide qualified personnel to perform required inspections and tests as required by Section 07 08 15; scope of service provided by the inspection agency will be limited to the following:

1.7.2.1 Prompt notification of Consultant and Construction Manager of irregularities or deficiencies observed in the Work during performance of its services.
1.7.2.2 Inspection agency is not authorized to release, revoke, alter, or enlarge requirements of the Contract Documents or approve or accept any portion of the Work; inspection agency will report findings to the Owner and Consultant; Consultant will require changes to the work, where report indicates deficiencies in the construction of the Building Envelope.
1.7.2.3 Inspection agency will not be permitted to perform any duties of the Construction Manager.

1.8 BUILDING ENVELOPE MOCK-UPS

1.8.1 Provide required Mock-Ups in accordance with Section 01 45 00 – Quality Control.
1.8.2 Arrange for construction of full size mock-ups on site at locations determined by Consultant of critical wall assembly components consisting of the following:

- 1.8.2.1 Wall structure and substrates
- 1.8.2.2 Air and vapour membranes
- 1.8.2.3 Transition membranes at doors and windows and other penetrations
- 1.8.2.4 Transition membranes at roof to wall junction
- 1.8.2.5 Insulation and fastening materials
- 1.8.2.6 Cladding materials and support materials

1.8.3 Mock-ups will be staged so that each layer of construction can be reviewed for installation methods, with testing performed during each stage of construction to verify performance before succeeding layers of materials are applied.

1.8.4 Mock-ups will have a sealed interior compartment capable of replicating anticipated interior conditions and pressure differential under normal building conditions during occupancy; following tests will be conducted on the mock-up:

- 1.8.4.1 Water spray test of windows in accordance with ASTM E1105.
- 1.8.4.2 Smoke tracer test with pressurization in accordance with ASTM E1186.

1.8.5 Building Envelope Inspector will report deficiencies arising from observations of installed components and tests and recommend modifications to installation methods to reduce likelihood of observed deficiencies from occurring in final construction.

1.8.6 Maintain Building Envelope mock-up for duration of construction affecting construction of the building enclosure for reference purposes:

- 1.8.6.1 Mock-up may form a part of completed construction provided that it is undamaged and in a serviceable condition at Substantial Performance.
- 1.8.6.2 Remove mock-up that do not form a part of the completed construction once building enclosure is completed.
- 1.8.6.3 Remove deficient mock-up where repairs cannot be made to the acceptance of the Building Envelope Inspector.

2 Products

2.1 PERFORMANCE REQUIREMENTS

2.1.1 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 Requirements.

2.1.2 Common performance requirements required to maintain continuity of the Building Envelope include the following:

- 2.1.2.1 Correct installation of Products at joints and transitions to provide airtight assemblies.
- 2.1.2.2 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.
- 2.1.2.3 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.
2.1.3 Products used for air barrier and vapour retarder systems forming the Building Envelope shall be in accordance with the Building Code and as follows:

2.1.3.1 Materials: Materials specified for the project have been selected for the following performance requirements; any Trade Contractor proposed Substitutions will be assessed to the same performance requirements:

2.1.3.1.1 Air Leakage Rate: 0.02 L/s • m² maximum measured at an air pressure differential of 75 Pa, in accordance with ASTM E2178.

2.1.3.1.2 Permeance: 3.5 ng/Pa • s • m² maximum.

2.1.3.2 Assemblies: Assemblies described in the specifications and drawings have been selected for the following performance requirements; any Trade Contractor proposed Substitutions will be assessed to the same performance requirements:

2.1.3.2.1 Air Leakage Rate: 0.05 L/s • m maximum measured at an air pressure differential of 75 Pa, in accordance with ASTM E1677 where warm side Relative Humidity is between 27 and 55%.

2.1.3.2.2 Permeance: 10 ng/Pa • s • m² maximum where warm side Relative Humidity is between 27 and 55%.

3 Execution

3.1 INSTALLATION

3.1.1 Conform to the requirements of this Section to maintain and protect continuity and integrity of the Building Envelope.

3.1.2 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.

3.1.3 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.

3.1.4 Maintain continuity of Building Envelope across expansion and control joints whether indicated and designed or not.

3.1.5 Refer to referenced Related Requirements for specific requirements and any site testing.

3.2 OWNER’S SITE TESTING AND INSPECTION ACTIVITIES

3.2.1 Owner will hire a testing and inspection agency to provide Continuous observation and inspection during installation of the air barrier and vapour retarder systems in accordance with Section 07 08 15.

3.2.2 Cooperate with agencies performing Owner’s required inspections, tests, and similar services; notify inspection agency in advance of required testing in accordance with Section 07 08 15; provide auxiliary services as required by testing agency including the following:

3.2.2.1 Access to the Work.

3.2.2.2 Incidental labour and facilities necessary to facilitate inspections and tests.

3.2.2.3 Adequate quantities of representative samples of materials that require testing or assist the agency in taking samples.
3.2.2.4 Deliver samples to testing laboratories, when requested.
3.2.2.5 Security and protection of samples and test equipment at the Project Site.
3.2.2.6 Coordinate the sequence of activities to accommodate required inspection services with a minimum of delay.
3.2.2.7 Coordinate activities to avoid removing and replacing construction to accommodate inspections and tests.
3.2.2.8 Construction Manager is responsible for scheduling times for inspections, tests, taking samples, and similar activities.

3.3 REPAIR AND PROTECTION

3.3.1 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.

3.3.2 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.

3.3.3 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.

3.3.4 Protect vapour retarder membranes from cold in final building construction using insulation.

END OF SECTION
1 General

1.1 SUMMARY

1.1.1 This Section provides common design requirements relating to technical specification sections forming a part of fire and smoke rated assemblies and systems for installation by specialized Trade Contractor's:

1.1.1.1 Design of Rated Systems is a joint responsibility of the Consultant, the Construction Manager, the manufacturer and installing Trade Contractor, and the Authority Having Jurisdiction.

1.1.1.2 Drawings indicate suggested solutions to fire and smoke 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 and smoke rated System.

1.1.1.3 Drawings do not portray complete assessment of all conditions associated with fire and smoke rated separations, assemblies and materials.

1.1.1.4 Delegated design requirements of this section are included to complete the required details for the Project.

1.1.1.5 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.

1.1.2 This Section provides requirements for identification of 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 Trade Contractor.

1.1.3 It is a requirement of this Section that work relating to construction of fire and smoke rated assemblies and components is installed under the responsibility of a single source specialty firestop and smokeseal applicator or by the Construction Manager, or by several firestop and smokeseal applicators that are closely supervised by the Construction Manager in accordance with requirements forming a part of the related references included in this Section.

1.2 RELATED REQUIREMENTS

1.2.1 Section 03 30 00 – Cast-in-Place Concrete: Materials used in fire and smoke rated assemblies.

1.2.2 Section 04 81 00 – Unit Masonry Assemblies: Materials used in fire and smoke rated assemblies.

1.2.3 Section 06 10 53 – Miscellaneous Rough Carpentry: Fire retardant treated lumber and panels.

1.2.4 Section 07 81 00 – Applied Fireproofing: Design of fire resistive material applied to structural members to obtain a required fire rating.

1.2.5 Section 07 81 23 – Intumescent Fireproofing: Design of fire resistive material applied to structural members to obtain a required fire rating.

1.2.6 Section 07 84 00 – Firestopping and Smokeseals: Design and labelling of openings through fire resistive assemblies, top-of-wall and building perimeter joints, mechanical and electrical penetrations, and other firestop or smokeseal components.

1.2.7 Section 08 11 13 – Steel Doors and Frames: Labelling of fire rated [and temperature rise rated (TRR)] doors and frames.

1.2.8 Section 08 31 00 – Access Doors and Frames: Labelling of fire rated access doors and frames.
1.2.9 Section 09 21 16 – Gypsum Board Assemblies: Labelling of fire and smoke rated assemblies and partitions.

1.2.10 Division 21 – Fire Suppression: Labelling of fire suppression systems; coordination of firestop and smokeseals penetrations through other assemblies.

1.2.11 Division 23 – Heating, Ventilating and Air Conditioning: Coordination of fire and smoke rated dampers and detection systems; labelling of dampers and detection systems; coordination of firestop and smokeseals penetrations through other assemblies.

1.2.12 Division 28 – Electronic Safety and Security: Labelling of fire detection and alarm systems.

1.2.13 Work of other sections having fire and smoke resistant construction or separation ratings.

1.3 DEFINITIONS

1.3.1 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.

1.3.2 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.

1.3.3 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:

1.3.3.1 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.

1.3.3.2 Engineered Judgements must be signed by a CFPS, and form a part of the delegated design submittal required by this section and Section 01 33 50 – Delegated Design Submittals.

1.3.4 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.

1.3.5 Rated Systems: A system that has a specific assembly rating and design or listing number assigned to it from a Recognized Testing Authority; a single example follows, additional design listings must be provided with project solutions for fire and smoke assemblies:

1.3.5.1 ULC Design No. D708 – Floor Assembly: Provides the specific requirements for concrete and reinforcing, steel deck, joint covers, spray applied fire resistive materials and ratings applicable to restrained and unrestrained assemblies, and the assembly is specific to one manufacturer’s product(s) in a specific testing configuration.

1.3.5.2 Assemblies or systems using materials that have not been tested as a part of a Rated System, or that are not capable of obtaining an Engineered Judgement will not be acceptable for use on this Project.

1.3.5.3 Materials having only a testing label from a Recognized Testing Authority will not be acceptable for use on this Project unless they form a part of a specific Rated System.
1.3.6 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:

1.3.6.1 Underwriters Laboratories of Canada (ULC)
1.3.6.2 Underwriters Laboratories Inc. (UL)
1.3.6.3 Warnock Hersey (WH) and Electrical Testing Labs (ETL) Listed
1.3.6.4 ETL, UL and WH labelling will only be acceptable subject to the following conditions:
   1.3.6.4.1 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 cUL, cULus, cWH or cWHus markings.
   1.3.6.4.2 Materials that only have UL, ULus, WH or WHus markings are not acceptable.

1.3.6.5 Examples of acceptable marks from Recognized Testing Authorities:

1.3.7 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:

1.3.7.1 Details may be based on specific Rated Systems provided by a Recognized Testing Authority.
1.3.7.2 Details may be based on time assigned to materials listed in the Building Code.
1.3.7.3 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 submiting design information for firestopping and smoke seal systems required for the Project to the Consultant prior to starting work.

1.4 REFERENCE STANDARDS

1.4.1 Intertek Group:
1.4.1.1 Directory of WH Listed Building Products
1.4.1.2 Directory of ETL Listed Electrical and Electronic Products

1.4.2 International Firestop Council (IFC):
1.4.2.1 Guidelines for Evaluating Firestop Systems Engineering Judgments

1.4.3 Underwriters Laboratories of Canada (ULC):
1.4.3.1 Directory of Burglar and Fire Alarm Systems and Components
1.4.3.2 Directory of Building Materials
1.4.3.3 Directory of Fire Protection Equipment
1.4.3.4 Directory of Fire Resistance
1.4.3.5 Directory of Firestop Systems and Components
1.4.3.6 Directory of Heating and Ventilating Equipment, Flammable Liquids and Gases Equipment, and Marine Equipment

1.4.4 Underwriters Laboratories Inc. (UL):
1.4.4.1 UL Fire Resistive Assemblies and Systems, Certified for Canada.

1.5 ADMINISTRATIVE REQUIREMENTS

1.5.1 Delegated Design: Design fire resistive assemblies, firestopping and smokeseals required by the Contract Documents to withstand fire ratings indicated on Drawings and in accordance with requirements of the Building Code:
1.5.1.1 Provide manufacturers standard details where site conditions match standard assembly listings.
1.5.1.2 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.
1.5.1.3 Confirm proposed rated system materials and methods to applicable codes and ordinances of the Authority Having Jurisdiction.
1.5.1.4 Additional performance requirements are listed in the referenced technical specification sections.

1.5.2 Coordination: Trade Contractor is required to notify the Construction Manager where their work passes through a fire separation or removes any fire resistive materials, so that the penetration or damage is filled or repaired by an acceptable installation contractor to maintain the integrity of the fire separations:
1.5.2.1 Trade Contractor is required to notify the Construction Manager prior to penetrating any load bearing assembly that does not have a predetermined penetration location; Rated Systems do not re-establish the structural integrity of load bearing partitions or assemblies, or support live loads and traffic.
1.5.2.2 Rated System can be either “built-in” (such as; integral with concrete placement) or “post-installed”; provide built-in Rated System devices prior to concrete placement or masonry installation.
1.5.2.3 Coordinate construction of openings and penetrating items and verify that through Rated Systems are installed according to specified requirements.
1.5.2.4 Coordinate sizing of sleeves, openings, core-drilled holes, or cut openings to accommodate penetrations through fire and smoke rated separations.

1.5.3 Preinstallation Conference: Conduct conference at Project site in accordance with the requirements of Section 01 31 00 – Project Meetings to discuss proposed Rated Systems supplied by the installing Trade Contractor and manufacturer, modifications to the Consultant’s Standard Details, Engineered Judgements, placement of identification labels and coordination issues, and as follows:
1.5.3.1 Attendees for meetings include the Consultant, Construction Manager, installing Trade Contractor’s, Manufacturer’s Authorized Representative(s; the Authority Having Jurisdiction can be invited as a courtesy, but it is not mandatory that they attend the meeting.

1.5.4 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:
1.5.4.1 Authority Having Jurisdiction: Notify Authority Having Jurisdiction in sufficient time to allow for inspection prior to Rated Systems being covered up or enclosed.
1.5.5 Sequencing: Sequence installation of fire and smoke rated components to maintain the continuity of fire separations whether or not shown on the drawings:

1.5.5.1 Fire separations may not be pierced by electrical or similar service outlets except in accordance with Building Code.

1.5.5.2 Do not support non-combustible construction on combustible construction.

1.5.5.3 Firestop 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.

1.5.5.4 Do not use combustible members, fastenings, and similar items to anchor fixtures to fire separations.

1.5.5.5 Firestop openings for non-combustible pipes and ducts to prevent the passage of smoke and flame.

1.6 QUALITY ASSURANCE

1.6.1 Rated Systems specified for the Project will be supplied and installed by a Trade Contractor specializing in the application of specific systems as follows:

1.6.1.1 Spray Applied Fire Resistive Materials: Specified in Section 07 81 00 for fire rating of structural systems – Single Source Responsibility for Project.

1.6.1.2 Thin Film Intumescent Fire Resistive Materials: Specified in Section 07 81 23 for fire rating of structural systems – Single Source Responsibility for Project.

1.6.1.3 Firestopping and Smokeseals: Specified in Section 07 84 00 for mechanical and electrical penetrations, floor and wall openings, top-of-wall seals, perimeter building seals and re-enterable cable management systems – Single Source Responsibility for Project.

1.6.2 Trade Contractors installing Rated Systems must be certified by the Manufacturer to install any named Products, and have a minimum of five (5) years experience in the types of Rated Systems specified for the Project.

1.6.3 Manufacturer’s authorized representative (not distributor or agent) will be onsite during initial installation of Rated Systems to train Trade Contractor’s personnel in proper selection and installation procedures in accordance with manufacturer’s written recommendations.

1.7 SUBMITTALS

1.7.1 Submit a summary of Rated Systems proposed for use in the Project within four (4) weeks of starting work of the Contract in accordance with Section 01 33 00 – Submittal Procedures, and as follows:

1.7.1.1 Provide summary of manufacturer’s details and Engineered Judgements in a format similar to that attached to the end of this Section.

1.7.1.2 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.

1.7.1.3 Manufacturer’s Details:

1.7.1.3.1 Submit manufacturer’s details indicating an assembly or system that matches the design intent provided by the Standard Details.

1.7.1.3.2 Manufacturer’s standard details must be signed by CFPS, and include only content that is applicable to the Work of the Project.

1.7.1.3.3 Provide additional details as required to address additional detail conditions not covered by the Standard Details.
1.7.1.4 Engineered Judgements:

1.7.1.4.1 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.

1.7.1.4.2 Engineered Judgments must include project name and Trade Contractor’s name who will install Rated System described in the Engineered Judgement.

1.7.1.4.3 Engineered Judgements must be signed by a CFPS employed by the manufacturer, and who was directly responsible for preparation of the Engineered Judgement.

1.7.1.4.4 Prepare Engineered Judgements in accordance with IFC Guidelines for Evaluating Firestop Systems Engineering Judgements.

1.7.2 Letters of Commitment and Compliance:

1.7.2.1 Provide letters of Commitment and Compliance as required by Section 01 33 50 – Delegated Design Submittals.

1.7.2.2 A principal of the installing company and the Manufacturer’s Authorized Representative (CFPS) jointly sign required letters instead of a professional engineer as required by Section 01 33 50.

1.7.2.3 Submit additional letters of Commitment and Compliance where there are more than one Manufacturer’s Authorized Representative or installing Trade Contractors.

1.7.3 Samples: Submit samples of each type of firestopping, smokesal and accessory to the Consultant prior to starting work.

1.8 MOCK-UP

1.8.1 Provide Mock-Up in an accessible location at the Project site ready for review by the Authority Having Jurisdiction and the Consultant in accordance with Section 01 45 00 – Quality Control.

1.8.2 Mock-Up will be representative of the Rated Systems used for the Project, and be kept in a location that can be referenced during the entire construction period; Mock-Up will form the basis for acceptance of installed systems by the Authority Having Jurisdiction and the Consultant.

1.8.3 Refer to individual technical specification sections, which may provide additional requirements for Mock-Ups.

2 Products

2.1 DESIGN REQUIREMENTS

2.1.1 Fire Test Response Characteristics: 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:

2.1.1.1 Provide a label and proof of fire resistive materials used in Rated Systems issued by a Recognized Testing Authority.

2.1.1.2 Refer to technical sections for specific requirements for sealing penetrations and joints of smoke and fire separations.
2.2 MATERIALS

2.2.1 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.

2.2.2 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.

3 Execution

3.1 RESPONSIBILITIES OF PARTIES INVOLVED

3.1.1 The Consultant is responsible for the following:

3.1.1.1 Provide Standard Details of Rated Systems for the guidance of the Construction Manager, Trade Contractors, and Authority Having Jurisdiction; Standard Details represent design intent only, and do not portray every condition that may arise in the construction process.

3.1.1.2 Review manufacturer’s submittals for conformance to design intent to comply with the Consultant’s requirements for completing schedules required by the Building Code.

3.1.2 The Construction Manager is responsible for the following:

3.1.2.1 Direct Trade Contractors responsible for installation of Rated Systems to submit a summary of Rated Systems used in the project for submission to the Authority Having Jurisdiction and the Consultant.

3.1.2.2 Direct Trade Contractors responsible for installation of Rated Systems to complete any Mock-Ups required by the technical specification sections ready for review by the Authority Having Jurisdiction and the Consultant.

3.1.2.3 Direct the Trade Contractor to submit Letters of Commitment and Compliance to the Consultant.

3.1.2.4 Direct the Trade Contractor to notify the Authority Having Jurisdiction to inspect installed Rated Systems.

3.1.3 The Authority Having Jurisdiction will be responsible for the following:

3.1.3.1 Review manufacturer’s submittals for compliance with local codes and ordinances.

3.1.3.2 Review Mock-Ups (if any) for compliance with local codes and ordinances.

3.1.3.3 Review of installed Rated Systems for compliance with local codes and ordinances.

3.2 SITE REVIEW

3.2.1 Notify Consultant a minimum of seven days in advance of completion of installation of fire and smoke rated systems and firestop installations; confirm dates and times on days preceding each series of installations.

3.2.2 Do not cover up fire and smoke rated construction or firestop systems that will become concealed behind other construction until Consultant has reviewed and Authority Having Jurisdiction’s building inspector have examined each installation.
3.2.3 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 firestopping and smokeseals:

3.2.3.1 Make all necessary repairs and correct all deficiencies noted after completion of cut tests.

3.3 SITE QUALITY CONTROL

3.3.1 Owner will retain a qualified third party inspection agency to conduct site review of fire and smoke rated construction to verify that fire and smoke rated assemblies, firestopping and smokeseals have been installed in accordance with governing regulations, requirements of the manufacturer and to meet acceptance criteria of the Authorities Having Jurisdiction.

3.3.2 Third party inspection agency will be responsible for the following:

3.3.2.1 Review Contract Documents and verify Code requirements.
3.3.2.2 Attend pre-construction meetings.
3.3.2.3 Review submittals of drawings, assemblies and samples.
3.3.2.4 Review mock-ups and provide input into mock-up requirements.
3.3.2.5 Perform periodic site reviews and provide reports.
3.3.2.6 Perform thickness and density testing and provide reports.
3.3.2.7 Upon project completion provide a letter of certification indicating that code requirements have been met.

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### 3.4 SAMPLE SUMMARY FORM

3.4.1 The following Sample Summary Form can be used to develop the listing of Rated Systems required for the Project as noted in Item 1.7.1 above:

**RATED SYSTEM SUMMARY SHEET**

<table>
<thead>
<tr>
<th>Project Name</th>
<th>Date:</th>
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<tbody>
<tr>
<td>Project Address:</td>
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<tr>
<td>Installing Trade Contractor</td>
<td>Telephone:</td>
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<tr>
<td>Installer’s Address:</td>
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<td>Submitted to: DIALOG®</td>
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#### SPRAY APPLIED FIRE RESISTIVE MATERIALS

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<tr>
<th>Type of Assembly: Wall, Floor, Roof or Ceiling</th>
<th>Combustible or Non-Combustible Assembly</th>
<th>Rating: Time, Restraint or Unrestrained</th>
<th>Design or Listing Number</th>
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#### INTUMESCENT FIRE RESISTIVE MATERIALS

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<th>Type of Assembly: Wall, Floor, Roof or Ceiling</th>
<th>Combustible or Non-Combustible Assembly</th>
<th>Rating: Time, Restraint or Unrestrained</th>
<th>Design or Listing Number</th>
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### CONCRETE FIRE PENETRATIONS – HORIZONTAL OR VERTICAL (FT RATING)

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<tr>
<th>Type of Penetration</th>
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### RATED SYSTEM SUMMARY SHEET

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<td>Project Address:</td>
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<td>Installing Trade Contractor:</td>
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<td>Installer's Address:</td>
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#### PENETRATIONS THROUGH FLOOR ASSEMBLIES

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**PERIMETER SEALS, TOP-OF-WALL DETAILS AND OTHER FIRESTOPPING**

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1 General

1.1 SUMMARY

1.1.1 This section is included for the information of the Construction manager and Building Envelope Trade Contractors so that they can coordinate their activities with the Owner’s inspection and testing agency:

1.1.1.1 This section forms a part of the requirements for Durable Building specified in Section 01 45 26.23 – Site Quality Control Procedures: Durable Building Quality Management Program for commissioning of the building envelope and confirmation of the Regional Priority Credit 1 – Durable Building.

1.1.1.2 This section includes administrative and procedural requirements for periodic inspections (not full time inspection) required for monitoring construction of an airtight Building Envelope that resists flow of moisture (exfiltration) and deflects water (infiltration).

1.1.1.3 Construction Manager and Trade Contractors are only required to include coordination costs, and are not responsible for actual costs of inspection and testing; costs for inspection and testing will be paid for by the Owner directly.

1.1.1.4 Inspection and testing services specified in this Section are required to verify that specified performance requirements are met and do not relieve Construction Manager of responsibility for compliance with Contract Document requirements.

1.1.2 Inspection and Testing: This section specifies inspection and testing of Building Envelope assemblies including membranes, transitions between envelope components, penetrations, insulation installation, doors and windows including, but not limited to, the following:

1.1.2.1 Preconstruction Services: Review Consultant’s drawings, details and specifications and make recommendations for changes in materials or design of Building Envelope relating to constructability and conformance with Building Envelope, Best Practice defined in this Section.

1.1.2.2 Construction Coordination: Building Envelope Inspector will receive a complete set of Contract Documents, shop drawings and site instructions relating to work described by this Section their use in reviewing the construction and will be required to participate in the following:

1.1.2.2.1 Attend and coordinate Building Envelope pre-installation meetings and inform participants of expectations for Building Envelope installation and performance.

1.1.2.2.2 Make recommendations to Consultant for corrective measures where materials are installed incorrectly or with obvious deficiencies; Consultant will direct corrective actions required by the Trade Contractor.

1.1.2.2.3 Confirm that recommend corrective measures are completed as installation progresses; obtain confirmation from Construction Manager that repairs are completed where the Building Envelope Inspector cannot make direct observation.
1.1.2.3 Air and Vapour Membranes: Confirm that membrane materials and installation are adequate to control air, vapour and moisture penetration in accordance with manufacturer’s instructions[, Building Envelope, Best Practices] and as follows:

1.1.2.3.1 Confirm tightness of air and vapour seal after installation of wall and roof membranes, and transitions between doors and windows by smoke candle observation.

1.1.2.3.2 Verify performance of building air seal after completion of Building Envelope by pressure testing and recording pressure drops; note difference between actual measurement and theoretical achievable measurement.

1.1.2.4 Insulation: Confirm that insulation is installed to specified values; that insulation is installed continuously; and that thermal breaks are adequately treated to reduce the potential for formation of condensation within the Building Envelope and as follows:

1.1.2.4.1 Verify completeness and effectiveness of building insulation using infrared (IR) scanning and recording equipment.

1.1.2.5 Glass and Glazing: Confirm that National Fenestration Rating Council (NFRC) ratings on windows are met for specified U-value and Specific Heat Gain Coefficients (SHGC) as specified in Section 08 81 00; confirm that Low E coatings on windows are installed on the correct surface.

1.1.2.6 Record Keeping: Record findings and submit to Consultant, Owner and Construction Manager during the progress of the work, include the following:

1.1.2.6.1 Summarize report findings for final submission including confirmation of corrective actions recommended for installed work.

1.1.2.6.2 Obtain records from Construction Manager confirming completion of corrective measures where work is covered up between regularly scheduled site visits.

1.2 RELATED REQUIREMENTS

1.2.1 Section 01 31 19 – Project Meetings
1.2.2 Section 01 33 00 – Submittals
1.2.3 Section 01 33 50 – Delegated Design Submittals
1.2.4 Section 01 45 00 – Quality Control: Inspection and testing requirements; construction of mock-ups.
1.2.5 Section 01 45 26.23 – Site Quality Control Procedures: Durable Building Quality Management Program, required inspections at approximately 75% and 100% completion of building envelope construction.]
1.2.6 Division 01 – Commissioning General Requirements: Recording
1.2.7 Section 03 45 00 – Precast Architectural Concrete
1.2.8 Section 07 05 10 – Common Work Results for Air Barrier and Vapour Retarder Systems: Construction Manager’s quality management program used to record actions taken to correct deficiencies identified by Consultant or testing agency.
1.2.9 Section 07 08 50 – Membrane Roofing Inspection and Testing
1.2.10 Section 07 25 13 – Air and Vapour Membranes
1.2.11 Section 07 52 23 – Cold Adhesive Applied Bituminous Membrane Roofing
1.2.12 Section 07 62 00 – Sheet Metal Flashing and Trim
1.2.13 Section 07 92 00 – Joint Sealants
1.2.14 Section 08 11 13 – Steel Doors and Frames
1.2.15 Section 08 44 13 – Glazed Aluminum Curtains Walls
1.2.16 Section 08 63 00 – Metal Framed Skylights
1.2.17 Section 08 81 00 – Glass Glazing: Specified NFRC ratings for window units.

1.3 DEFINITIONS

1.3.1 Building Envelope: Building Envelope is comprised of the moisture retarding and airtight components of the building enclosure including joints, junctures and transitions between materials, products, and assemblies; that rely on the following for successful implementation:

1.3.1.1 Cooperation between all parties involved with the Work
1.3.1.2 Coordination, scheduling and sequencing of the Work
1.3.1.3 Preconstruction meetings, sample installations and mock-ups
1.3.1.4 Inspections, tests, and related actions
1.3.1.5 Corrective actions and record keeping

1.3.2 Building Envelope Inspector: A professional engineer, architect or technologist having specific experience in Building Envelope science, and who has a minimum of five (5) years of experience with work similar to that of the Project; following additional definitions relate to the scope-of-work for the Building Envelope Inspector:

1.3.2.1 Educate: Establish logic and installation reasoning as a part of Building Envelope meetings, communicate need for attention to detail as a part of Building Envelope installation.
1.3.2.2 Identify: Observe site conditions and identify deficiencies that require corrective actions by the Trade Contractor and follow-up by the Construction Manager.
1.3.2.3 Verify: Recording of detailed review and testing of installed materials to ascertain specified performance criteria.
1.3.2.4 Confirm: Recording of observations of installed materials and comparison to technical specifications, manufacturer’s literature to ascertain conformance with established Building Envelope practices.

1.3.3 Building Envelope, Best Practice: Construction procedures, methods and materials used to achieve specified air tightness, moisture resistance and water vapour control of the Building Envelope using details prepared by the Consultant, correcting deficiencies recorded by Building Envelope Inspector and corrective actions identified quality management program prepared by Construction Manager.

1.4 REFERENCE STANDARDS

1.4.1 American Architectural Manufacturer’s Association (AAMA):

1.4.1.1 AAMA 501.2-09, Quality Assurance and Diagnostic Water Leakage Field Check for Installed Storefronts, Curtain Walls and Sloped Glazing Systems

1.4.2 American National Standards Institute (ANSI)/American Society of Heating, Refrigerating and Air-Conditioning Engineers, Inc. (ASHRAE):

1.4.2.1 ASHRAE 101-1981, Application of Infrared Sensing Devices to the Assessment of Building Heat Loss Characteristics

1.4.3 American Society for Testing and Materials (ASTM):

1.4.3.1 ASTM E283-04 (2012), Standard Test Method for Determining the Rate of Air Leakage through Exterior Windows, Curtain Walls, and Doors under Specified Pressure Differences across the Specimen
1.4.3.2 ASTM E779-10, Standard Test Method for Determining Air Leakage Rate by Fan Pressurization
1.4.3.3 ASTM E1105-00 (2008), Standard Test Method for Field Determination of Water Penetration of Installed Exterior Windows, Skylights, Doors, and Curtain Walls, by Uniform or Cyclic Static Air Pressure Difference
1.4.3.4 ASTM E1186-03 (2009), Standard Practices for Air Leakage Site Detection in Building Envelopes and Air Barrier Systems

1.4.4 Canadian General Standards Board (CGSB):
1.4.4.1 CAN/CGSB 149-GP-2MP, Manual for Thermographic Analysis of Building Enclosures
1.4.4.2 CAN/CGSB-149.10-M86, Determination of the Airtightness of Building Envelopes by the Fan Depressurization Method
1.4.4.3 CAN/CGSB 149.15-96, Determination of the Overall Envelope Airtightness of Buildings by the Fan Pressurization Method using the Building’s Air Handling Systems

1.4.5 National Fenestration Rating Council (NFRC):
1.4.5.1 NFRC 100-2001: Procedures for Determining Fenestration Product U-Factors
1.4.5.2 NFRC 102-2002: Test Procedure for Measuring the Steady-State Thermal Transmittance of Fenestration Systems
1.4.5.3 NFRC 200-2001: Procedure for Determining Fenestration Product Solar Heat Gain Coefficient and Visible Transmittance at Normal Incidence, including current addenda.

1.5 ADMINISTRATIVE REQUIREMENTS
1.5.1 Coordination: Successful implementation of Building Envelope requires input and coordination from all project participants as specified in Section 07 05 10 and as follows:
1.5.1.1 Participate and coordinate with Owner’s Building Envelope Specialist to coordinate reporting requirements of third party specialist who is providing oversight of construction activities and comprehensive Building Envelope commissioning.

1.5.2 Scheduling: Schedule construction of full size wall mock-up assemblies specified in Section 07 05 10 with Construction Manager and contributing Trade Contractor’s.

1.6 QUALITY ASSURANCE
1.6.1 Qualifications: Submit qualifications of Building Envelope Inspector including the following:
1.6.1.1 Proof of membership in good standing of a recognized Building Envelope association.
1.6.1.2 Proof of experience in all aspects of the required work and be familiar with specified Building Envelope materials.
1.6.1.3 Proof of experience as a Building Envelope Inspector covering a minimum time period of five (5) years.
1.6.1.4 Listing of applicable training or educational programs relating to Building Envelope design and inspection.
1.6.1.5 Statement that Building Envelope Inspector is independent from the Construction Manager and Building Envelope Trade Contractors.

1.6.2 Mock-Ups: Schedule and arrange review of full size wall assembly mock-up of, door and window components and transition membranes specified in Section 07 05 10
1.7 SUBMITTALS

1.7.1 Inspection Reports:

1.7.1.1 Submit inspection reports on a monthly basis in accordance with article 2.1 below; submit copies of reports to:

1.7.1.1.1 Owner
1.7.1.1.2 Consultant
1.7.1.1.3 Construction Manager; who will distribute copies to the affected Building Envelope Trade Contractors.

1.7.1.2 Notify Consultant and Owner of non-compliant workmanship or materials, and recommended corrective action within one (1) day of discovery.

1.7.2 Letter of Conformance:

1.7.2.1 Submit Letter of Conformance to Consultant in accordance with Section 01 33 50 stating a belief that materials and methods used for construction meets requirements of manufacturer’s instructions, Building Envelope, Best Practices and design intent indicated in Consultants documents, and are in substantial conformance with the requirements of the Building Code.

1.7.2.2 Summarize Building Envelope Inspection activities performed during the progress of the Work; signed by Building Envelope Inspector responsible for inspection and testing program.

1.7.3 Progress Payments:

1.7.3.1 Prepare detailed monthly invoices addressed to the Owner and submit to Consultant for review.

2 Products

2.1 REPORTS

2.1.1 Maintain a weekly log of events, observations and recommendations, deficiencies and corrective instructions, and submit as directed in Subparagraph 1.7.1.1 above.

2.1.2 Terms of reference for inspection and testing services for Building Envelope membranes include:

2.1.2.1 Review and reporting of drawings, details and specifications for compliance with manufacturer’s instructions and Building Envelope, Best Practices, and as follows:

2.1.2.1.1 Provide suggested modifications to Consultant’s documents and manufacturer’s standard details (if any) required for compliance with manufacturer’s instructions and Building Envelope, Best Practices.

2.1.2.1.2 Coordinate a preinstallation meeting with Consultant, Construction Manager and Building Envelope Trade Contractors to discuss any modifications to documents required for compliance with detailed drawing requirements; manufacturer’s instructions and Building Envelope, Best Practices.

2.1.2.2 Review and report on-going Building Envelope work relating to substrate preparation, installation of air and vapour membranes, insulation, Building Envelope accessories, window, doorframes and penetrations, flashings, membrane flashings and membranes; coordinate with Construction Manager for estimated time span of Building Envelope operations.
2.1.2.3 Building Envelope Inspector is responsible for weekly review of work and reporting compliance during progress of the work at regularly scheduled intervals.

2.1.2.4 Responsibility for quality of construction and compliance with Contract Documents rests solely with Construction Manager.

2.1.2.5 Consultant will make all engineering decisions with respect to rejection criteria and rework required.

2.1.2.6 Address copies of Building Envelope inspection reports to Owner with copies sent to Consultant, Construction Manager, and Building Envelope Trade Contractors.

3 Execution

3.1 INSPECTION AND TESTING

3.1.1 It is the responsibility of Construction Manager to notify Building Envelope Inspector regarding timing of inspection and testing with respect to the Construction Schedule.

3.1.2 Building Envelope Inspector coordinates with Construction Manager’s schedule and make themselves aware of the current work schedule and bring to the attention of Consultant and Construction Manager any inspection or testing requirement apparently being overlooked.

3.1.3 Building Envelope Inspector makes regular site visits for the duration of the Building Envelope work, having a duration as required to form an opinion on compliance of the work.

3.1.4 Immediately inform Consultant and seek instructions where Building Envelope Inspector recommends additional inspection or testing beyond that stipulated in this scope of service.

3.1.5 Immediately inform Consultant where site conditions are such that a reduced program of inspection and testing is deemed appropriate.

3.1.6 Initial Inspection: Confirm that materials being used for project are as specified and as follows:

3.1.6.1 Confirm that construction and materials are in conformance with manufacturer’s instructions and Building Envelope, Best Practices.

3.1.6.2 Conduct review of substrates, comment on condition and acceptability for specified Building Envelope membranes.

3.1.6.3 Conduct a pre-installation meeting and coordinate manufacturer’s written instructions with Trade Contractors affected by Building Envelope work.

3.1.6.4 Record observations and instructions, clarifications and corrective actions stated during pre-installation meeting and initial review and distribute copies as noted in Subparagraph 1.7.1.1 above.

3.1.7 Interim Inspections: Conduct on-going weekly reviews of work progress, recording progress and deficiencies, and written instructions, clarifications or corrective actions required by Building Envelope Trade Contractors, and as follows:

3.1.7.1 Record weather conditions.

3.1.7.2 Record names and certificate numbers of Registered Torch Applicators, where torch applied membranes are specified.

3.1.7.3 Prepare plan indicating work completed on day of observation.

3.1.7.4 Confirm that Building Envelope materials, flashings, Building Envelope accessories and ancillary materials are in accordance with specification and manufacturer’s requirements.
3.1.7.5 Perform periodic smoke candle testing as work progresses and verify that Building Envelope membrane is being installed in accordance with manufacturers’ requirements and Building Envelope, Best Practice.

3.1.8 Record observations and instructions, clarifications and corrective actions stated during interim inspections and distribute copies as noted in Subparagraph 1.7.1.1 above.

3.1.9 Coordinate number of required interim reviews with Building Envelope Trade Contractor’s work schedule as approved by Construction Manager.

3.2 PERFORMANCE TESTING: BUILDING ENVELOPE MOCK-UP

3.2.1 Coordinate construction of mock-ups with Section 07 05 10.

3.2.2 Test mock-up for wind, air and water infiltration and confirm that proposed Building Envelope assembly meets or exceeds expected performance criteria for best Building Envelope practice using following test methods:

- **3.2.2.1 Water Tightness:** Water testing in accordance with ASTM E1105 using chamber depressurization
- **3.2.2.2 Air Tightness:** Smoke testing in accordance with ASTM E1186 using chamber pressurization or depressurization

3.2.3 Maintain a record of details used to construct mock-up including any modification required to meet performance criteria; inform Construction Manager and Building Envelope Trade Contractors of results of mock-up and methods that they can incorporate into the Work to maintain best Building Envelope practice established by the mock-up.

3.3 PERFORMANCE TESTING: WHOLE BUILDING THERMAL CONTINUITY

3.3.1 Perform infrared thermographic scan of building and verify continuity of building insulation system in accordance with CGSB 149-GP-2MP.

3.3.2 Maintain a photographic record of deficiencies observed during infrared thermographic scans and make recommendations for corrective construction and distribute copies as noted in Subparagraph 1.7.1.1 above.

3.4 PERFORMANCE TESTING: WHOLE BUILDING AIR TIGHTNESS

3.4.1 Perform smoke candle testing in locations determined by the Consultant after completion of Building Envelope and confirm continuity of Building Envelope air membrane seal in accordance with ASTM E1186 using building pressurization or depressurization.

3.4.2 Maintain a record of observations and make recommendations for corrective construction to the Owner, Consultant and Construction Manager.

3.5 INSPECTIONS OF PREFABRICATED UNITS

3.5.1 Review materials fabricated off-site at place of manufacture; fabricated materials include, but are not limited to, the following:

- **3.5.1.1 Precast Concrete Panels**
- **3.5.1.2 Prefabricated Cladding Systems**
- **3.5.1.3 Sealed Glass Units**
- **3.5.1.4 Prefabricated Window Units**
- **3.5.1.5 Unitized Curtain Wall Glazing Systems**

3.5.2 Maintain a record of observations and make recommendations for corrective construction and distribute copies as noted in Subparagraph 1.7.1.1 above and to affected fabricator.

3.6 FINAL INSPECTION

3.6.1 Prepare deficiency list indicating corrective measures required and any hold-back amounts required where corrective measures are not forthcoming.
3.6.2 Record observations and instructions, and make final submission listing outstanding repairs.

3.6.3 Submit a Letter of Conformance in accordance with Paragraph 1.7.2 above.

3.7 ADDITIONAL INSPECTION AND TESTING

3.7.1 Additional inspections, reviews or testing will be conducted only as instructed by Owner.

3.7.2 No costs for extra work will be accepted unless pre-approved by Owner.

END OF SECTION
General

1.1 SUMMARY

1.1.1 This section is included for the information of the Construction Manager and Roofing Trade Contractors so that they can coordinate their activities with the Owner’s inspection and testing agency; costs for inspection and testing will be paid for by the Owner directly; Construction Manager and Trade Contractors will include coordination costs only, do not include any costs for actual inspection and testing.

1.1.2 This section specifies inspection and testing of roofing assemblies specified Section 07 52 23 – Cold Adhesive Applied Modified Bituminous Membrane Roofing.

1.1.3 Intent of this section is to provide requirements daily roof inspections (not full time inspection) for duration of roofing installation, with roofing inspector providing site specific recommendations and corrections to deficient materials or workmanship, and recording observations, recommendations and corrections on weekly basis.

1.2 RELATED REQUIREMENTS

1.2.1 Division 01 – General Commissioning Requirements

1.2.2 Section 07 08 15 – Building Envelope Inspection and Testing

1.2.3 Section 07 52 23 – Cold Adhesive Applied Modified Bituminous Membrane Roofing

1.2.4 Section 07 62 00 – Sheet Metal Flashing and Trim

1.3 DEFINITIONS

1.3.1 Owner: Owner is hereby identified as [Name and Address] and personnel assigned to this aspect of the work.

1.3.2 Consultant: Consultant is hereby identified as DIALOG® and personnel assigned to this aspect of the work.

1.3.3 Construction Manager: Construction Manager is hereby identified as Stuart Olson and personnel assigned to this aspect of the work.

1.3.4 Trade Contractor: Trade Contractor is the successful roofing contractor as identified by the Construction Manager.

1.3.5 Roofing Inspector: An ARCA Warranty Ltd. listed and Accepted Roofing Inspector.

1.4 REFERENCE STANDARDS

1.4.1 Alberta Roofing Contractors Association Ltd. (ARCA):

1.4.1.1 Manual on Good Roofing Practice and Accepted Roofing Systems
1.4.2 Canadian General Standards Board (CGSB):
   1.4.2.1 CGSB 37-GP-56M, Membrane, Modified, Bituminous, Prefabricated and Reinforced for Roofing.

1.4.3 Underwriters Laboratories Canada (ULC):
   1.4.3.1 CAN/ULC S701-01, Thermal Insulation, Polystyrene, Boards and Pipe Covering.
   1.4.3.2 CAN/ULC S704-2001, Thermal Insulation, Polyurethane and Polyisocyanurate Boards, Faced

1.5 QUALITY ASSURANCE
   1.5.1 List Roofing Inspection Personnel having completed the ARCA Warranty Ltd. accepted training program as an ARCA Warranty Ltd. Accepted Roofing Inspector.
   1.5.2 Roofing Inspectors are experienced in all aspects of the required work and familiar with specified roofing materials.
   1.5.3 Roofing Inspectors are independent of Construction Manager and Roofing Trade Contractor.

1.6 SUBMITTALS
   1.6.1 Provide required information in accordance with Section 01 33 00 – Submittal Procedures.
   1.6.2 Notify Consultant and Owner of non-compliant workmanship or materials, and recommended corrective action within one (1) day of discovery.
   1.6.3 Submit daily inspection reports on a weekly basis.
   1.6.4 Submit a final report summarizing previous reports and specifically stating a belief as to the compliance of the work; signed by Roofing Inspector responsible for inspection and testing program.
   1.6.5 Submit copies of reports to:
      1.6.5.1 Owner
      1.6.5.2 Consultant
      1.6.5.3 Construction Manager
      1.6.5.4 Roofing Trade Contractor.
      1.6.5.5 ARCA Warranty Ltd.
   1.6.6 Prepare detailed monthly invoices addressed to Construction Manager and submit to Consultant for review.

2 Products

2.1 GENERAL
   2.1.1 It is the responsibility of Construction Manager to notify Roofing Inspector regarding timing of inspection and testing.
   2.1.2 Roofing Inspection company must coordinate with Construction Manager’s schedule and make themselves aware of the current work schedule and bring to the attention of Consultant and Construction Manager any inspection or testing requirement apparently being overlooked.
2.1.3 Roofing Inspectors make daily site visits for the duration of the roofing work, having a duration as required to form an opinion on compliance of the work.

2.1.4 Immediately inform Consultant and seek instructions where Roofing Inspector recommends additional inspection or testing beyond that stipulated in this scope of service.

2.1.5 Immediately inform Consultant where site conditions are such that a reduced program of inspection and testing is deemed appropriate.

2.2 REPORTS

2.2.1 Maintain a daily log of events, observations and recommendations, deficiencies and corrective instructions, and submit on a weekly basis.

2.2.2 Terms of reference for inspection and testing services for roofing membranes include:

2.2.2.1 Review and reporting of drawings, details and specifications for compliance with Alberta Roofing Contractor’s Association (ARCA) Ltd.’s requirements for an ARCA Warranty Ltd. 5 Year Certificate of Acceptance:

2.2.2.1.1 Provide suggested modifications to Consultant’s documents and Manufacturer’s standard details (if any) required for compliance with ARCA requirements.

2.2.2.1.2 Coordinate a preinstallation meeting with Consultant, Construction Manager and Roofing Trade Contractor to discuss any modifications to documents required for compliance with ARCA requirements.

2.2.2.2 Review and report on-going roofing work relating to substrate preparation, installation of air/vapour membranes, insulation, blockings and curbs, roofing accessories, drains and penetrations, flashings, membrane flashings and membranes.

2.2.2.3 Roofing Inspector is responsible for daily review of work and reporting compliance to References and Contract Documents during progress of the work at regularly scheduled intervals.

2.2.2.4 Responsibility for quality of construction and compliance with Contract Documents rests solely with Construction Manager.

2.2.2.5 Consultant will make all engineering decisions with respect to rejection criteria and rework required.

2.2.2.6 Address all copies of roofing inspection reports to Owner with copies sent to Consultant, Construction Manager, Roofing Trade Contractor and ARCA Warranty Ltd.

3 Execution

3.1 INITIAL INSPECTION

3.1.1 Confirm that materials being used for project are as specified.

3.1.2 Confirm that curb construction, roof slope, perimeter blocking and materials are as specified and are acceptable to ARCA Warranty Ltd.’s requirements.

3.1.3 Conduct review of roof deck and substrates, comment on condition and acceptability for specified roof membranes.
3.1.4 Conduct a pre-installation meeting and coordinate manufacturer’s written instructions and ARCA Warranty Ltd.’s requirements for 5 Year Certificate of Assurance.

3.1.5 Record observations and instructions, clarifications and corrective actions stated during pre-installation meeting and initial review.

3.2 INTERIM INSPECTIONS

3.2.1 Conduct on-going daily reviews of work progress, recording progress and deficiencies, and written instructions, clarifications or corrective actions required by Roofing Trade Contractor, and as follows:

3.2.1.1 Record weather conditions.
3.2.1.2 Record name of supervisor and workers, including their trade status (i.e.: journeyman, apprentice or labourer)
3.2.1.3 Record names and certificate numbers of Registered Torch Applicators.
3.2.1.4 Prepare roof plan indicating work to be completed on day of observation.
3.2.1.5 Confirm on following day’s report extent of roofing completed on previous day, and prepare new roof plan indicating current day’s planned objectives.
3.2.1.6 Confirm that roofing materials, flashings, roofing accessories and ancillary materials are in accordance with specification and manufacturer’s requirements.

3.2.2 Coordinate number of required interim reviews with Roofing Trade Contractor’s work schedule as approved by Construction Manager.

3.3 FINAL INSPECTION

3.3.1 Prepare deficiency list indicating corrective measures required and any hold-back amounts required where corrective measures are not forthcoming.

3.3.2 Prepare final roof plan indicating penetrations and roofing accessories as required by ARCA Warranty Ltd.

3.3.3 Make final submissions required by ARCA Warranty Ltd. and facilitate delivery of roofing warranties to Owner.

3.4 ADDITIONAL INSPECTION AND TESTING

3.4.1 Additional inspections, reviews or testing is to be conducted only as instructed by Construction Manager. No costs for extra work will be accepted unless pre-approved by Construction Manager.

END OF SECTION
1 General

1.1 SUMMARY

1.1.1 This Section includes requirements for supply and installation of a cold applied elastomeric below grade waterproofing membranes including surface preparation and accessories required for a complete system.

1.2 RELATED REQUIREMENTS

1.2.1 Section 03 30 00 – Cast-in-Place Concrete

1.2.2 Section 07 21 13 – Board Insulation: Below grade insulation system.

1.2.3 Section 07 25 13 – Air and Vapour Membranes: Coordination with wall air and vapour membrane materials.

1.2.4 Section 07 92 00 – Joint Sealants

1.3 REFERENCE STANDARDS

1.3.1 American Society for Testing and Materials (ASTM):

1.3.1.1 ASTM D4263-83 (2012), Standard Test Method for Indicating Moisture in Concrete by the Plastic Sheet Method

1.3.1.2 ASTM D5295-00 (2006), Standard Guide for Preparation of Concrete Surfaces for Adhered (Bonded) Membrane Waterproofing Systems

1.3.1.3 ASTM E154/E154M-08a(2013)e1, Standard Test Methods for Water Vapor Retarders Used in Contact with Earth Under Concrete Slabs, on Walls, or as Ground Cover

1.3.2 Canadian General Standards Board (CGSB):

1.3.2.1 CAN/CGSB 37.58-M86, Membrane, Elastomeric, Cold Applied Liquid for Non-Exposed Use in Roofing and Waterproofing

1.4 ADMINISTRATIVE REQUIREMENTS

1.4.1 Preconstruction Meeting: Arrange a preconstruction meeting in accordance with Section 01 31 19 – Project Meetings attended by Construction Manager, Consultant, Owner and installing Trade Contractor, and others affected by work of this Section to discuss and confirm requirements for waterproofing, including the following:

1.4.1.1 Surface preparation specified under other Sections

1.4.1.2 Substrate condition and pre-treatment

1.4.1.3 Minimum curing period

1.4.1.4 Forecasted weather conditions

1.4.1.5 Special details and sheet flashings

1.4.1.6 Installation procedures

1.4.1.7 Testing and inspection procedures

1.4.1.8 Protection and repairs

1.4.2 Coordination: Coordinate with work affected by other Sections for placement of drainage panels, weeping tile systems and placement of backfilling so that installation of work of this Section is completed without interruption and to minimize exposure of membranes to UV effects of sunlight.
1.5 SUBMITTALS

1.5.1 Provide required information in accordance with Section 01 33 00 – Submittal Procedures.

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

1.5.2.1 Product Data: Submit copies of the most current technical data sheets, describing materials physical properties, and explanations about product installation, including installation techniques, restrictions, limitations and other manufacturer recommendations and as follows:

1.5.2.1.1 Submit membrane manufacturer’s standard details that will be utilized for this project, indicate changes that must be made to make the details project specific for review by the Consultant.

1.5.2.1.2 Submit sloped insulation manufacturer’s proposed roofing diagrams and layouts for review by the Consultant.

1.5.3 Informational Submittals: Submit the following before starting work of this Section:

1.5.3.1 Compatibility Certificate: Submit a written certification that waterproofing membrane materials and components are compatible with adjacent air and vapour membranes.

1.5.4 Sustainable Design Submittals: Coordinate project sustainable design requirements with Section 01 35 31 - LEED Special Project Procedures and Section 01 35 31A - LEED Material Information Sheet for LEED Submittals.

1.6 QUALITY ASSURANCE

1.6.1 Qualifications: Provide proof of qualifications when requested by Consultant:

1.6.1.1 Installer: Use a qualified installer who is authorized, approved, or licensed by waterproofing manufacturer to install manufacturer's products, and having experience with installations of similar complexity and scope.

1.6.1.2 Source of Supply: Obtain waterproofing materials and protection course panels from one source from a single manufacturer.

1.7 DELIVERY, STORAGE AND HANDLING

1.7.1 Delivery and Acceptance Requirements: Deliver liquid materials to Project site in original containers with seals unbroken, labelled with manufacturer's name, product brand name and type, date of manufacture, shelf life, and directions for storing and mixing with other components.

1.7.2 Storage and Handling Requirements: Store liquid materials in their original undamaged containers in a clean, dry, protected location and within the temperature range required by waterproofing manufacturer and as follows:

1.7.2.1 Do not store materials on the structure in concentrations that exceed the design live load.

1.7.2.2 Remove and replace liquid materials that cannot be applied within their stated shelf life.

1.7.2.3 Protect stored materials from direct sunlight.
1.8 SITE CONDITIONS

1.8.1 Ambient Conditions: Apply waterproofing within the range of ambient and substrate temperatures recommended by waterproofing manufacturer and as follows:

1.8.1.1 Apply waterproofing to dry substrates, when relative humidity is less than 85%, and when surface and ambient temperatures are 3°C above dew point.
1.8.1.2 Do not apply waterproofing in snow, rain, fog or mist, or when such weather conditions are imminent during application and curing period.
1.8.1.3 Maintain adequate ventilation during application and curing of waterproofing materials.

1.9 WARRANTY

1.9.1 Submit written warranty, signed by waterproofing manufacturer agreeing to repair or replace waterproofing that does not comply with requirements or that does not remain watertight for a period of two (2) years from Substantial Performance, and as follows:

1.9.1.1 Warranty is inclusive of all failures except for failures resulting from failure of substrate prepared and treated in accordance with requirements or formation of new joints and cracks in substrate exceeding 1.5 mm in width.
1.9.1.2 Warranty is inclusive for procedures to gain access to waterproofing membrane including removal and reinstallation of earthwork, protection board, drainage panels, and insulation.

2 Products

2.1 MANUFACTURERS

2.1.1 Acceptable Materials Manufacturers: Subject to compliance with requirements specified in this Section; where multiple listings of manufacturers occur, use any of the following listed manufacturers' products in accordance with Section 01 62 00 – Product Options including the following:

2.1.1.1 Bakor Inc.
2.1.1.2 Tremco Commercial Sealants and Waterproofing
2.1.1.3 W.R. Meadows

2.1.2 Substitutions: Consultant may consider additional manufacturers having similar products to Acceptable Materials Manufacturers listed above during the construction period, provided they meet the performance requirements established by the named products and provided they submit requests for substitution in accordance with Section 01 25 00 – Substitution Procedures before starting any work of this Section:

2.1.2.1 Do not use substitute materials to establish Bid Price.
2.1.2.2 Substitutions that appear as a part of the project without review and acceptance by the Consultant will be rejected, and replaced with one of the specified materials.
2.2 MATERIALS

2.2.1 Waterproofing Membrane: Single component, water based bituminous, elastomeric waterproofing meeting the requirements of CAN/CGSB-37.58, containing not less than 60% solids, compatible assembly components, able to develop bond to substrate under conditions of service and application indicated.

2.2.1.1 Acceptable Materials:

- 2.2.1.1.1 Bakor, Aqua-Bloc 720-38
- 2.2.1.1.2 W.R. Meadows, Mel-Rol LM
- 2.2.1.1.3 Tremco, TREMproof 250GC

2.2.2 Auxiliary Materials: Materials required for a complete and functioning waterproof membrane system and as follows:

- 2.2.2.1 Primer: Manufacturer's standard, factory formulated polyurethane or epoxy primer.
- 2.2.2.2 Sheet Flashing: Nominal 1.5 mm, manufacturer's standard non-staining premanufactured elastomeric membrane and adhesive.
- 2.2.2.3 Reinforcing Strip: Manufacturer's recommended fibreglass mesh or polyester fabric.
- 2.2.2.4 Joint Sealant: Multi-component polyurethane sealant, compatible with waterproofing; and as recommended by manufacturer for substrate and joint conditions.
- 2.2.2.5 Below Grade Insulation: Refer to Section 07 12 13.

3 Execution

3.1 EXAMINATION

3.1.1 Examine surfaces and conditions affecting waterproofing and report any detrimental conditions before proceeding with any work of this Section and as follows:

- 3.1.1.1 Verify that concrete has cured and aged for minimum time recommended by waterproofing manufacturer.
- 3.1.1.2 Verify that substrate is visibly dry and free of moisture, and that capillarity is below manufacturers written tolerances.

3.1.2 Test concrete surfaces for moisture using manufacturer’s required moisture testing methods; installation will represent installers acceptance of conditions.

3.2 PREPARATION

3.2.1 Surface Preparation: Clean and prepare substrate in accordance with ASTM D5295 and manufacturer's written recommendations and as follows:

- 3.2.1.1 Mask off adjoining surfaces not receiving waterproofing to protect other materials from spillage or overspray.
- 3.2.1.2 Close off deck drains and other deck penetrations to prevent spillage and migration of waterproofing fluids.
- 3.2.1.3 Remove grease, oil, bitumen, form release agents, paints, curing compounds, and other penetrating contaminants or film forming coatings from concrete.
- 3.2.1.4 Remove fins, ridges, and other projections and fill honeycomb, aggregate pockets, and other voids.
3.2.2 Preparation at Terminations and Penetrations: Prepare vertical and horizontal surfaces at terminations and penetrations through waterproofing and at expansion joints, drains, and sleeves in accordance with manufacturer’s written instructions and as follows:

3.2.2.1 Prime substrate in accordance with waterproofing manufacturer’s written instructions.
3.2.2.2 Apply double thickness of waterproofing and embed joint reinforcing strip in preparation coat.
3.2.2.3 Provide sealant cants around penetrations and at inside corners of deck-to-wall butt joints.

3.2.3 Joint and Crack Treatment: Prepare, treat, rout, and fill joints and cracks in substrate in accordance with manufacturer’s written instructions and as follows:

3.2.3.1 Remove dust and dirt from joints and cracks before coating surfaces.
3.2.3.2 Apply bond breaker between sealant and preparation strip.
3.2.3.3 Prime substrate and apply a single thickness of preparation strip extending minimum 75 mm along each side of joint.
3.2.3.4 Apply double thickness of waterproofing and embed joint reinforcing strip in preparation coat.
3.2.3.5 Install sheet flashing and bond to deck and wall substrates where indicated or as required by waterproofing manufacturer’s written instructions; extend sheet flashings onto perpendicular surfaces and other work penetrating substrate.

3.3 INSTALLATION

3.3.1 Waterproofing Application: Apply waterproofing in accordance manufacturer’s written instructions after concrete has cured to acceptable moisture levels and vapour emissions, and not less than 14 days after concrete forms are removed and as follows:

3.3.1.1 Start installing waterproofing in presence of manufacturer’s technical representative.
3.3.1.2 Apply primer over prepared substrate.
3.3.1.3 Mix materials and apply waterproofing by spray, roller, notched squeegee, trowel, or other application method suitable to spatial orientation of substrate.
3.3.1.4 Apply membrane in sufficient coats to obtain seamless installation free from trapped gasses or air pockets to an average dry film thickness of 1.5 mm, with no less than 1.3 mm dry film thickness at any point of the installation.
3.3.1.5 Verify wet film thickness of waterproofing every 10 m².

3.3.2 Protection Board: Apply manufacturer’s required waterproofing protection covering when required by manufacturer and at locations where drainage composites are not used; provide methods for protecting waterproofing membranes from backfilling operations and methods for repair when protection coverings are not required by manufacturer.

3.4 PROTECTION

3.4.1 Remove temporary protection at completion of work under this Section.

END OF SECTION
1 General

1.1 SUMMARY

1.1.1 Work of this section includes, but is not limited to supply and installation of Crystalline Waterproofing applied to the surface of concrete substrates, at the following locations:

1.1.1.1 Dry side of elevator pits and sump pits.
1.1.1.2 Dry side of tunnels, underground vaults, dry wells, and manholes.
1.1.1.3 Wet side of planters.

1.2 RELATED REQUIREMENTS

1.2.1 Section 03 30 00 – Cast-In-Place Concrete: Installation of waterstop joint materials supplied by this section.
1.2.2 Section 07 21 13 – Board Insulation: Below grade insulation.
1.2.3 Section 07 92 00 – Joint Sealants: Expansion joint treatment for cast-in-place concrete.
1.2.4 Section 07 95 13 – Expansion Joint Cover Assemblies: Supply and installation of pre-manufactured expansion joints.
1.2.5 Section 14 21 00 - Electric Traction Elevators: Coordination with elevator pit penetrations.
1.2.6 Section 31 05 00 – Common Work Results for Earthwork: Supply and installation of backfill materials.

1.3 REFERENCE STANDARDS

1.3.1 American National Standards Institute/NSF International:

1.3.1.1 NSF/ANSI 61-2008, Drinking Water System Components - Health Effects

1.3.2 American Society for Testing and Materials (ASTM):

1.3.2.1 ASTM C39/C39M-12, Standard Test Method for Compressive Strength of Cylindrical Concrete Specimens
1.3.2.2 ASTM C 267-01 (2006), Standard Test Methods for Chemical Resistance of Mortars, Grouts, and Monolithic Surfacing and Polymer Concretes
1.3.2.3 ASTM E 329-08, Standard Specification for Agencies Engaged in the Testing and/or Inspection of Materials Used in Construction

1.3.3 United States Army Corps of Engineers Specifications:

1.3.3.1 COE CRD-C 48 - Standard Test Method for Water Permeability of Concrete; 1992.

1.4 ADMINISTRATIVE REQUIREMENTS

1.4.1 Pre-Construction Meetings: Arrange a pre-construction meeting in accordance with Section 01 31 19 – Project Meetings, prior to commencement of installation of materials specified in this section. Purpose of meeting, as follows:

1.4.1.1 Establish procedures to maintain required working conditions.
1.4.1.2 Coordinate work of related and adjacent work.
1.4.1.3 Review substrate conditions
1.4.1.4 Review manufacturer’s warranty requirements
1.4.1.5 Verify manufacturer’s current installation requirements and recommendations match final waterproofing details required for site.
1.4.2 Required personnel, as follows:
  1.4.2.1 Consultant
  1.4.2.2 Waterproofing installer
  1.4.2.3 Manufacturer’s authorized representative
  1.4.2.4 Construction Manager
  1.4.2.5 Trade contractors responsible for work penetrating waterproofing and work adjacent to waterproofing
  1.4.2.6 [Owner’s Representative]

1.5 SUBMITTALS

1.5.1 Provide required information in accordance with Section 01 33 00 – Submittal Procedures.

1.5.2 Action Submittals: Provide the following submittals before starting any work of this Section:
  1.5.2.1 Product Data: Submit manufacturer’s product data, with complete general and specific installation instructions, recommendations, and limitations affecting installation.
  1.5.2.2 Submit representative samples of the following for review by Consultant:
    1.5.2.2.1 Crystalline waterproofing.

1.5.3 Informational Submittals: Provide the following submittals during the course of the work:
  1.5.3.1 Certificates:
    1.5.3.1.1 Submit certificates signed by manufacturer certifying that materials comply with specified performance characteristics and physical requirements; and that waterproofing system and components; materials are supplied by a single source manufacturer.
    1.5.3.1.2 Submit written certification that installer has current approved applicator status with waterproofing material manufacturer.
  1.5.3.2 Site Quality Control Submittals: Submit written report summarizing manufacturer’s observations, and indicating results of final inspection and any corrective action required for changes arising from deficiencies or site conditions.

1.5.4 Sustainable Design Submittals: Coordinate project sustainable design requirements with Section 01 35 31 - LEED Special Project Procedures and Section 01 35 31A - LEED Material Information Sheet for LEED Submittals.

1.6 QUALITY ASSURANCE

1.6.1 Manufacturer Qualifications: A firm with not less than ten (10) years experience manufacturing crystalline waterproofing of the type specified, able to provide test reports showing compliance with specified performance characteristics, and able to provide on-site technical representation to advise on installation.

1.6.2 Installer Qualifications: Experienced in work of the type specified in this section and approved in writing by waterproofing manufacturer.

1.7 MOCK-UPS

1.7.1 Provide required Sample Installation in accordance with Section 01 45 00 – Quality Control.

1.7.2 Construct mock-up minimum 5 m² including typical detailing and accessory components required for a complete installation of materials specified in this Section.
1.7.3 Allow 24 hours notification to Consultant for review of mock-up before proceeding with waterproofing work; schedule installation of mock-up to avoid adverse weather conditions and prevent inadvertent wetting of materials.

1.7.4 Allow for adjustments to mock-ups that may be required to suit site conditions and variations from manufacturer’s standard details; completed panel will form basis of acceptance for remainder of work of this Section.

1.7.5 Accepted mock-ups may form a part of installation required for this Section.

1.8 DELIVERY, STORAGE AND HANDLING

1.8.1 Delivery and Acceptance Requirements: Deliver materials in factory sealed and labelled packaging, and as follows:
   1.8.1.1 Sequence deliveries to avoid delays and to minimize on site storage.
   1.8.1.2 Handle and store following manufacturer’s instructions, recommendations and material safety data sheets.

1.8.2 Storage and Handling Requirements: Store and handle materials in accordance with manufacturer’s instructions, and as follows:
   1.8.2.1 Do not double stack pallets during shipping or storage.
   1.8.2.2 Protect waterproofing materials from moisture, excessive temperatures and sources of ignition.
   1.8.2.3 Provide cover to top, bottom and sides for materials stored on site, allowing for adequate ventilation.
   1.8.2.4 Protect from construction operation related damage, damage from weather, excessive temperatures and prolonged sunlight.
   1.8.2.5 Remove damaged material from site and dispose of in accordance with applicable regulations.

1.9 SITE CONDITIONS

1.9.1 Ambient Conditions: Perform work only when existing and forecasted weather conditions are within guidelines established by the manufacturer for installation of waterproofing materials.

1.9.2 Do not install waterproofing materials where standing or ponding water conditions occur.

1.10 WARRANTY

1.10.1 Manufacturer Warranty: Provide manufacturer’s written system warranty for a period of five (5) years starting from substantial performance of the Project, covering materials and labour.

1.10.2 Manufacturer’s warranty shall be independent from, and run concurrently with, any other warranties for the Contract; submit warranty in the name of the Owner in accordance with Section 01 78 23 – Operations and Maintenance Data.

1.10.3 Installer Warranty: Provide warranty signed by installer that includes the following requirements:
   1.10.3.1 Installer warrants that, upon completion of the work, surfaces treated with crystalline waterproofing will be and will remain free of water leakage resulting from defective workmanship or materials for a period of ten (10) years from Date of Substantial Performance.
   1.10.3.2 In the event that water leakage occurs within the warranty period from such causes, the installer shall, at his own expense, repair, replace, or otherwise correct such defective workmanship and materials.
   1.10.3.3 Installer shall not be liable for consequential damages.
   1.10.3.4 Installer’s liability shall be limited to repair, replacement, or correction of defective workmanship and materials.
1.10.3.5 This warranty excludes leaks or other defects due to causes beyond the installer's control, including but not limited to structural failure, movement of the structure, fire, earthquakes, tornadoes, and hurricanes.

2 Products

2.1 MANUFACTURERS

2.1.1 Basis-of-Design Materials: Products named in this Section were used as the basis-of-design for the project; manufacturers listed as additional acceptable materials 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.

2.1.2 Additional Acceptable Materials Manufacturers: Subject to compliance with performance requirements specified in this Section; as established by the Basis-of-Design Materials, use any of the listed manufacturers’ products in accordance with Section 01 62 00 – Product Options; following manufacturer’s do not require submission of a request for substitutions provided required shop drawing and product data submissions are submitted before starting any work of Section:

2.1.2.1 Kryton Canada Corporation
2.1.2.2 Tremco, Permaquik Crystalline Waterproofing Systems
2.1.2.3 Xypex Chemical Corporation

2.1.3 Substitutions: Consultant may consider additional manufacturers having similar products to Acceptable Materials Manufacturers listed above during the construction period, provided they meet the performance requirements established by the named products and provided they submit requests for substitution in accordance with 01 25 00 – Substitution Procedures before starting any work of this Section:

2.1.3.1 Do not use substitute materials to establish Bid Price.
2.1.3.2 Substitutions that appear as a part of the project without review and acceptance by the Consultant will be rejected, and replaced with one of the specified materials.

2.2 MATERIALS

2.2.1 Waterproofing Products: Provide installed products that comply with following, when tested using cured concrete samples made without admixtures, with two 1 mm thick coats of waterproofing:

2.2.1.1 Penetration: At least 50 mm penetration of crystal-forming material, evidenced by scanning electron microscope photographs.
2.2.1.2 Permeability: No measurable leakage through waterproofed concrete, when tested in accordance with COE CRD-C 48 at 123.4 m of head or 1200 kPa using 50 mm thick, 13.8 MPa compressive strength concrete.
2.2.1.3 Chemical Resistance: No detrimental effects when tested using 27.6 MPa compressive strength concrete in accordance with ASTM C 267 using hydrochloric acid (pH of 3.5), brake fluid, transformer oil, ethylene glycol, toluene, and caustic soda as test mediums for duration of 84 days each; 14 % increase minimum in concrete compressive strength when tested in accordance with ASTM C 39/C 39M.
2.2.1.4 Potable water

2.2.2 Waterproofing: Two-coat crystalline waterproofing.
2.2.2.1 First Coat: Slurry proprietary compound of Portland cement, silica sand and active chemicals, mixed with water in proportions recommended by manufacturer to achieve specified coverage with application method used.

2.2.2.2 First Coat Coverage: Thickness and density as recommended by manufacturer

2.2.2.3 Second Coat Coverage: Thickness and density as recommended by manufacturer

2.2.2.4 Second Coat: Proprietary compound of Portland cement, silica sand and active chemicals, mixed with water in proportions recommended by manufacturer to achieve full coverage with application method used.

2.2.3 Top-of-Slab Waterproofing: Dry shake powder application on fresh concrete; proprietary compound of Portland cement, silica sand and various active chemicals, formulated as a powder compound for dry shake application.

2.2.4 Dry Pack Repair Compound: Dry pack consistency mixture of Xypex Concentrate; proprietary compound of Portland cement, silica sand and active chemicals; and water in proportions recommended by manufacturer.

2.2.5 Patching Compound: Single component, fast-setting, nonshrink, high bond strength hydraulic cement; with admixture where needed for increased bond strength to existing concrete.

2.2.6 Slurry Coat: Slurry proprietary compound of Portland cement, silica sand and active chemicals, mixed with water in proportions recommended by manufacturer to achieve the specified coverage with application method used.

3 Execution

3.1 EXAMINATION

3.1.1 Verify substrate conditions, which have been previously installed under other sections, are acceptable for product installation in accordance with manufacturer’s instructions.

3.1.2 Obtain waterproofing manufacturer’s approval of substrate conditions; submit site inspection report.

3.1.3 Do not install unless substrate and ambient air temperature are within range acceptable to waterproofing manufacturer.

3.2 NEWLY PLACED HORIZONTAL CONCRETE SURFACES

3.2.1 Comply with manufacturer’s product data sheets, technical bulletins, and installation instructions.

3.2.2 Apply rough wood float or broom finish.

3.2.3 Apply dry shake powder to fresh horizontal concrete surfaces at rate recommended by manufacturer. Incorporate powder into surface during concrete finishing process.

3.3 PREPARATION OF CURED CONCRETE

3.3.1 Prepare surfaces being treated in accordance with waterproofing manufacturer’s instructions.

3.3.2 Clean laitance, curing compounds, excess form oil, dirt film, paint, coatings or other foreign matter harmful to performance of waterproofing from surfaces of cured concrete being treated.

3.3.3 Prepare cured surfaces if necessary to provide open capillary surface; use acid etching, sandblasting, water blasting, or other methods as recommended by manufacturer.
3.3.4 Defects: Rout out defects, such as cracks, faulty construction joints, honeycombing, form tie holes, and other defects to sound concrete, and repair.

3.3.4.1 Chip defective areas into a U-shaped slot 25 mm wide and minimum 25 mm deep.
3.3.4.2 Clean slot, wet, saturate with water and remove surface water.
3.3.4.3 Apply specified slurry coat to slot at rate recommended by manufacturer.
3.3.4.4 Allow slurry coat to reach initial set.
3.3.4.5 Fill cavity with specified dry pack repair compound.
3.3.4.6 Compress tightly into cavity using pneumatic packer or hammer and blocks.

3.3.5 Rock Pockets, Honeycombing, and Other Defective Concrete:

3.3.5.1 Rout out defective areas to sound concrete.
3.3.5.2 Remove loose material and saturate with water.
3.3.5.3 Remove surface water and apply specified slurry coat.
3.3.5.4 After slurry coat has set, but while still green, fill cavity to surface with specified patching compound.

3.3.6 Coves: At right-angle intersections cove joint for smooth transition of waterproofed surface.

3.3.6.1 Apply specified slurry coat to slot at rate recommended by manufacturer.
3.3.6.2 Fill and form surfaces using specified dry pack repair compound or waterproofing material in mortar consistency while slurry coat is still green, but after slurry coat has reached initial set.
3.3.6.3 Trowel into cove shape.

3.3.7 Construction Joints: Apply sealing strips at each construction joint by filling grooves coinciding with construction joint.

3.3.7.1 If grooves have not been preformed, at least 19 mm wide and minimum 25 mm deep, saw cut and chip grooves to that dimension.
3.3.7.2 Apply specified slurry coat to slot at rate recommended by manufacturer.
3.3.7.3 Fill and form surfaces using specified dry pack repair compound while slurry coat is still green, but after slurry coat has reached initial set.
3.3.7.4 Compact tightly using pneumatic packer or hammer and block.

3.4 APPLICATION ON CURED CONCRETE

3.4.1 Comply with manufacturer’s instructions, including product data, technical bulletins, catalogue installation instructions, and product carton instructions.
3.4.2 Mix materials in accordance with manufacturer’s instructions.
3.4.3 Wet concrete surfaces and saturate with clean water to ensure migration of crystalline chemicals into concrete; remove free surface water before application of waterproofing treatment.
3.4.4 Exposed Surface Application: Apply waterproofing uniformly with semi-stiff bristle brush or spray under conditions and application rate recommended by manufacturer.
3.4.5 Apply second coat while first coat is still green, but after reaching initial set.
3.4.6 Use light pre-watering between coats when rapid drying conditions occur.
3.4.7 Curing: Cure exposed waterproofing treatment using a mist fog spray of clean water after coating has hardened sufficiently not to be damaged by spray; do not use plastic sheeting laid directly on waterproofing; air circulation is required.
3.4.7.1 If water curing is not possible, follow manufacturer’s recommendations for curing using chemical curing agent approved by manufacturer.

3.4.7.2 Avoid coating damage with spray operation.

3.4.7.3 Spray treated surface 3 times a day for 2 to 3 days.

3.4.7.4 In hot climates, spray treated surfaces at intervals recommended by waterproofing manufacturer.

3.4.7.5 During curing period, protect treated surfaces from rainfall, ambient temperature below freezing, and puddling of water.

3.4.7.6 Provide supplementary air circulation as recommended by waterproofing manufacturer.

3.4.8 Comply with waterproofing manufacturer’s recommendations for sequencing construction operations after waterproofing applications to avoid conditions detrimental to performance of waterproofing application.

3.5 SITE QUALITY CONTROL

3.5.1 Manufacturer’s Site Services: Provide manufacturer’s field service consisting of product use recommendations and periodic site visit for inspection of product installation in accordance with manufacturer’s instructions.

3.5.2 Do not cover waterproofed surfaces with other construction until they have been observed by manufacturer’s site representative and Consultant.

3.6 CLEANING AND PROTECTION

3.6.1 Clean spillage and overspray from adjacent surfaces using appropriate cleaning agents and procedures.

3.6.2 Protect installed product from damage during construction; do not allow traffic on unprotected waterproofed surfaces.

3.6.3 Do not backfill against waterproofed surfaces for at least 36 hours after installation; use moist backfill material when backfilling occurs less than 7 days after installation.

3.6.4 Do not apply paint or other coatings for at least 21 days; before applying coatings neutralize waterproofed surface as recommended by waterproofing manufacturer.

END OF SECTION
1 General

1.1 SUMMARY

1.1.1 This Section includes requirements for supply and installation of the following:

1.1.1.1 Cavity wall insulation

1.2 RELATED REQUIREMENTS

1.2.1 Section 07 25 13 – Air and Vapour Membranes

1.2.2 Section 07 21 29 – Sprayed Insulation: Filling of voids and gaps in board insulation using spray foam insulation.

1.2.3 Section 07 42 13 – Metal Wall Cladding

1.2.4 Section 07 42 43 – Composite Panels

1.3 DEFINITIONS

1.3.1 Long Term Thermal Resistance (LTTR): Defined as using testing methods described in either ASTM C1303 or CAN/ULC S770 to determine plastic foam insulation long term R-Value over a 15 year time period.

1.4 REFERENCE STANDARDS

1.4.1 American Society for Testing and Materials (ASTM):

1.4.1.1 ASTM C1303/C1303M-12, Standard Test Method for Predicting Long-Term Thermal Resistance of Closed-Cell Foam Insulation

1.4.2 Underwriters Laboratories Canada (ULC):

1.4.2.1 CAN/ULC S102-10, Method of Test for Surface Burning Characteristics of Building Materials and Assemblies

1.4.2.2 CAN/ULC S114-05, Test for Determination of Non-Combustibility in Building Materials

1.4.2.3 CAN/ULC S702-09, Thermal Insulation, Mineral Fibre, for Buildings

1.4.2.4 CAN/ULC S702.2-10, Mineral Fibre Thermal Insulation for Buildings, Part 2: Application Guidelines

1.4.2.5 CAN/ULC S770-09, Determination of Long-Term Thermal Resistance of Closed-Cell Thermal Insulating Foams

1.4.2.6 CAN/ULC S773-09, Thermal Insulation Terminology

1.5 SUBMITTALS

1.5.1 Provide required information in accordance with Section 01 33 00 – Submittal Procedures.

1.5.2 Sustainable Design Submittals: Coordinate project sustainable design requirements with Section 01 35 31 - LEED Special Project Procedures and Section 01 35 31A - LEED Material Information Sheet for LEED Submittals.

1.6 QUALITY ASSURANCE

1.6.1 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.
1.7 DELIVERY, STORAGE, AND HANDLING

1.7.1 Storage and Handling Requirements: Protect insulation materials from physical damage and from deterioration by moisture, soiling, and other sources. Store inside and in a dry location; follow manufacturer’s written instructions for handling, storing, and protecting during installation.

2 Products

2.1 MANUFACTURERS

2.1.1 Basis-of-Design Materials: Products named in this Section were used as the basis-of-design for the project; manufacturers listed as additional acceptable materials 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.

2.1.2 Additional Acceptable Materials Manufacturers: Subject to matching of colour and compliance with performance requirements specified in this Section; as established by the Basis-of-Design Materials, use any of the listed manufacturers’ products in accordance with Section 01 62 00 – Product Options; following manufacturer’s do not require submission of a request for substitutions provided required shop drawing and product data submissions are submitted before starting any work of Section:

2.1.2.1 Roxul Inc.

2.1.3 Substitutions: Consultant may consider additional manufacturers having similar products to Acceptable Materials Manufacturers listed above during the construction period, provided they meet the performance requirements established by the named products and provided they submit requests for substitution in accordance with 01 25 00 – Substitution Procedures before starting any work of this Section:

2.1.3.1 Do not use substitute materials to establish Bid Price.

2.1.3.2 Substitutions that appear as a part of the project without review and acceptance by the Consultant will be rejected, and replaced with one of the specified materials.

2.2 MATERIALS

2.2.1 Cavity Insulation: Use one of the following insulation materials at Trade Contractor’s option:

2.2.1.1 Fibrous Mineral Wall Insulation: Unfaced, preformed rigid fibrous mineral slag board insulation manufactured in accordance with CAN/ULC S702, Type 1, thermal resistance not less than RSI 0.76/25 mm; rated non-combustible in accordance with CAN/ULC S114 and having a flame spread rating of 5 or less in accordance with CAN/ULC S102; nominal 70 kg/m³ density; square edges, board size 406 mm x 1220 mm or 610 mm x 1220 mm as appropriate to application x thickness required to achieve insulation value indicated on Drawings:

2.2.1.1.1 Basis-of-Design Materials: Roxul CavityRock MD

2.2.2 Roof Insulation: Refer to Section 07 52 23, insulation types specific to roofing are specified as a part of roof system requirements.

2.2.3 Curtain Wall Spandrel Insulation: Refer to Section 08 44 13, insulation types specific to curtain wall spandrels are specified as a part of curtain wall system requirements.
2.3 ACCESSORIES

2.3.1 Insulation Fasteners:

2.3.1.1 Insulation Clips: Impale type, perforated 50 mm x 50 mm cold rolled carbon steel 0.912 mm core metal thickness, adhesive mounted; 2.657 mm diameter annealed steel wire spindle, length to suit insulation, 25 mm diameter self locking washers, and as follows:

2.3.1.1.1 Basis-of-Design Materials: Gemco Insulation Fasteners, Insulation Hanger; substitutions will be considered for this material.

3 Execution

3.1 EXAMINATION

3.1.1 Examine substrates and conditions for compliance with requirements for Sections in which substrates and related work are specified and other conditions affecting performance.

3.1.2 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.

3.1.3 Verify that all flashings provided under other Sections are installed and that they divert moisture to exterior of insulated systems.

3.2 PREPARATION

3.2.1 Clean substrates of substances harmful to insulations; remove projections that interfere with insulation attachment.

3.2.2 Proceed with installation only after unsatisfactory conditions have been corrected.

3.3 INSTALLATION

3.3.1 Install insulation and accessories in accordance with manufacturer's written instructions applicable to products and application indicated and as follows:

3.3.1.1 Use insulation that is undamaged, dry, and unsoiled and that has not been left exposed at any time to ice and snow

3.3.1.2 Maintain continuous thermal insulation, vapour barrier and air tightness for building spaces and elements, and as follows:

3.3.1.2.1 Saw cut and trim insulation neatly to fit spaces; fill voids with foamed-in-place insulation compatible with installed insulation, refer to Section 07 21 29

3.3.1.2.2 Butt edges and ends tight

3.3.1.2.3 Fit insulation tight against mechanical, electrical and other items protruding through the plane of insulation

3.3.1.2.4 Use insulation free of broken or chipped edges

3.3.1.2.5 Apply single layer of insulation to produce thickness indicated, unless multiple layers are otherwise specifically shown or required to make up total thickness

3.3.1.2.6 Fit insulation firmly against substrate using mechanical fasteners spaced in accordance with manufacturers recommended spacing and pattern; in addition, adhere insulation to uneven substrate surfaces and provide additional fasteners to eliminate air spaces between insulation and substrate

3.3.1.2.7 Mechanically fasten insulation boards 50 mm in from edges at 300 mm centres
3.3.1.3 Leave insulation joints unbonded over line of expansion and control joints; bond a continuous 150 mm wide strip of primary vapour membrane over expansion and control joints using compatible adhesive.

3.3.1.4 Protect insulation from damage until it is covered; replace any broken, sunburned, crushed or dented insulation immediately prior to covering; coordinate with backfilling operations.

3.3.2 Cavity Wall Insulation: Fit courses of insulation between wall ties and other confining obstructions in cavity; butt edges tightly in vertical and horizontal directions and as follows:

3.3.2.1 Install cavity insulation with a tight fit to substrate materials, provide adhesive and additional fasteners where uneven substrates cause air spaces behind insulation; apply adhesive to substrate in a continuous film not less than 3 mm thick when wet and bed the insulation into adhesive before adhesive loses its tack or skins-over.

3.3.2.2 Apply insulation fasteners using a minimum of six (6) fasteners in two rows located near the centre of the board along the narrow dimension and near the third points along the long dimension; secure boards with two clips at the centre where both dimensions are less than 600 mm.

3.3.2.3 Apply sheet membrane vapour retarder behind Z-bars prior to installation of insulation between Z-bars supporting preformed metal cladding.

3.3.2.4 Install insulation clips to walls before sheet membrane vapour retarders are applied.

3.4 PROTECTION

3.4.1 Protect installed board insulation from damage due to harmful weather exposures, physical abuse, and other causes.

3.4.2 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

1.1.1 This section includes requirements for supply and installation of a spray polyurethane foam insulation system.

1.2 RELATED REQUIREMENTS

1.2.1 Section 05 12 00 – Structural Steel

1.2.2 Section 05 31 10 – Steel Deck

1.3 DEFINITIONS

1.3.1 HCFC Free: Zero Global Warming, Zero Ozone Depletion (ODP) in compliance with Montreal Protocol requirement to eliminate production of HCFC 141b; products using HFC-245fa will be given preference over all other products.

1.3.2 LTTR (Long Term Thermal Resistance): Defined as using techniques from CAN/ULC S770 predicting foam’s insulating value that has been shown to be equivalent to the average performance of a permeably faced foam insulation product over 15 years.

1.4 REFERENCE STANDARDS

1.4.1 American Society for Testing and Materials (ASTM):

1.4.1.1 ASTM E783-02 (2010), Standard Test Method for Field Measurement of Air Leakage through Installed Exterior Windows and Doors

1.4.1.2 ASTM E1677-05, Standard Specification for an Air Seal (AR) Material or System for Low-Rise Framed Framed Walls

1.4.2 Canadian Urethane Foam Contractors Association (CUFCA):

1.4.2.1 CUFCA Quality Assurance Program, Licensed Contractor Program and Installer Certification Program

1.4.2.2 CUFCA Site Installer Reference Guides

1.4.3 Underwriters Laboratories Canada (ULC):

1.4.3.1 CAN/ULC S102-10, Method of Test for Surface Burning Characteristics of Building Materials and Assemblies

1.4.3.2 CAN/ULC S124-06, Standard Method of Test for the Evaluation of Protective Coverings for Foamed Plastic

1.4.3.3 CAN/ULC S127-07, Standard Corner Wall Method of Test for Flammability Characteristics of Non-Melting Foam Plastic Building Materials

1.4.3.4 CAN/ULC S705.1-01, Standard for Thermal Insulation-Spray Applied Rigid Polyurethane Foam, Medium Density-Material-Specification including amendments

1.4.3.5 CAN/ULC S705.2-05, Standard for Thermal Insulation-Spray Applied Rigid Polyurethane Foam, Medium Density-Material-Application

1.4.3.6 CAN/ULC S770-09, Standard Test Method for Determination of Long-Term Thermal Resistance of Closed-Cell Thermal Insulating Foams

1.5 ADMINISTRATIVE REQUIREMENTS

1.5.1 Pre-Construction Meeting: Arrange a pre-construction meeting in accordance with Section 01 31 19 – Project Meetings, and as follows:

1.5.1.1 Convene one (1) week before commencing work of this Section to discuss coordination and installation requirements of specified spray insulation system, transitions to adjacent membranes and requirements and location for site constructed mock-up listed below.
1.5.1.2 Building envelope inspector will arrange for a pre-construction meeting attended by the Consultant, Construction Manager, Trade Contractor, manufacturer’s factory trained agent and other subcontractors affected by the work of this Section.

1.5.2 Sequencing: Sequence work of this Section so that work for closures and substrates are installed before start of work for this Section.

1.6 SUBMITTALS

1.6.1 Provide required information in accordance with Section 01 33 00 – Submittal Procedures.

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

1.6.2.1 Product Data: Submit manufacturer's product data sheets for each type of material, including manufacturer's printed instructions for evaluating, preparing, and treating substrate, temperature and other limitations of installation conditions, technical data, and tested physical and performance properties.

1.6.3 Informational Submittals: Provide the following submittals during the course of the work:

1.6.3.1 Company License: Photocopy of Trade Contractor's CUFCA license, current for the term of the Contract and listing of certified installers used for the project.

1.6.3.2 Installer Certificates: Photocopies of each installers CUFCA applicator identification cards indicating certification for installation of foamed-in-place materials as thermal insulation, and as air and vapour barriers.

1.6.3.3 Onsite Documentation and Installation Instructions: Make manufacturer's installation instructions and daily testing reports available for viewing when requested by Consultant during installation period of materials specified in this Section.

1.6.3.4 Material Certificates: Submit certificate of compatibility by foamed-in-place insulation manufacturer, listing all materials on the project that it connects to or that come in contact with it, and documentation confirming that materials meet requirements for an air and vapour barrier.

1.6.3.5 Source Quality Control Submittals: Submit testing results performed by an accredited laboratory confirming material has been tested and conforms to the requirements listed Reference Standards.

1.6.3.6 Site Quality Control Submittals: Submit SPF Quality Assurance Program (QAP) documentation and reports in accordance with requirements listed in this Section at completion of work.

1.6.4 Sustainable Design Submittals: Coordinate project sustainable design requirements with Section 01 35 21 – LEED General Requirements and Section 01 35 21A – LEED Submittal Check List; in addition, provide information for following specific requirements of this Section.

1.7 QUALITY ASSURANCE

1.7.1 Regulatory Requirements: Provide insulations that meet requirements for non-ozone depleting materials as regulated in the Montreal Protocol adopted by the United Nations Environmental Program [and that have been tested in accordance with CAN/ULC S102 and CAN/ULC S127, with protective covering installed in accordance with CAN/ULC S124.
1.7.1.1 Manufacturer: Obtain foamed-in-place insulation materials from a single manufacturer regularly engaged in manufacturing the products specified in this Section and that manufacturer’s material conforming to the requirements of CAN/ULC S705.1.

1.7.1.2 Trade Contractor: Use only Trade Contractor that are licensed by CUFCA as required by CAN/ULC S705.2

1.7.1.3 Installers: Use companies having trained and certified installers in accordance with CAN/ULC S705.2 and by the foamed-in-place insulation manufacturer.

1.7.2 Certifications: Provide proof of the following during the course of the Work:

1.7.2.1 Quality Assurance Program: Arrange for onsite daily inspections and testing, documentation and reporting in accordance with CUFCA SPF Quality Assurance Program (QAP) as mandated by CAN/ULC S705.2.

1.7.2.2 Additional QA Agencies: Other Quality Assurance Agencies such as Morrison Hershfield or ITS may be acceptable to the Consultant provided that information indicating equivalency to CUFCA SPF QAP is provide before starting work of this Section.

1.8 MOCK-UP

1.8.1 Provide required Sample Installation in accordance with Section 01 45 00 – Quality Control, and as follows:

1.8.1.1 Area and Location: as directed by Consultant.

1.8.1.2 Mock-up will be reviewed by Consultant and accepted or reworked or repaired where changes to installation methods and procedures are required to meet project requirements.

1.8.1.3 Accepted mock-up can form part of the finished work; accepted mock-up will constitute the standard of acceptance for the remaining work.

1.9 DELIVERY, STORAGE, AND HANDLING

1.9.1 Delivery and Acceptance Requirements: Deliver materials to Project site in original packages with seals unbroken, labelled with manufacturer's name, product, date of manufacture, expiration date, and directions for storage.

1.9.2 Storage and Handling Requirements: Store materials in their original undamaged packages in a clean, dry, protected location and within temperature range required by spray insulation manufacturer, and as follows:

1.9.2.1 Protect stored materials from direct sunlight.

1.9.2.2 Avoid spillage; immediately notify Consultant if spillage occurs and start clean up procedures; clean spills and leave area as it was prior to spill.

1.10 SITE CONDITIONS

1.10.1 Ambient Conditions: Apply spray insulation within range of ambient and substrate temperatures recommended by spray insulation manufacturer; do not apply spray insulation to frozen, damp or wet substrates.

1.11 WARRANTY

1.11.1 Special Warranty: Provide CUFCA SPF QAP accepted third party warranty covering required correction to any defects and deficiencies in materials and workmanship for a period of two (2) years with term commencing on date of Substantial Performance for the Work of the Project.
2 Products

2.1 MANUFACTURERS

2.1.1 Acceptable Materials Manufacturers: Subject to compliance with requirements specified in this Section; where multiple listings of manufacturers occur, use any of the following listed manufacturers’ products in accordance with Section 01 62 00 – Product Options including the following:

2.1.1.1 BASF The Chemical Company
2.1.1.2 CertainTeed-Saint Gobain
2.1.1.3 Demilec Canada
2.1.1.4 Johns Manville
2.1.1.5 Lapolla Canada

2.1.2 Substitutions: Consultant may consider additional manufacturers having similar products to Acceptable Materials Manufacturers listed above during the construction period, provided they meet the performance requirements established by the named products and provided they submit requests for substitution in accordance with Section 01 25 00 – Substitution Procedures before starting any work of this Section:

2.1.2.1 Do not use substitute materials to establish Bid Price.
2.1.2.2 Substitutions that appear as a part of the project without review and acceptance by the Consultant will be rejected, and replaced with one of the specified materials.

2.2 MATERIALS

2.2.1 Spray Applied Polyurethane Foam: Two component, polyurethane resin and polyol, closed cell foamed-in-place insulation containing recycled materials in accordance with CAN/ULC S705.1, Type 2 and having the following minimum properties:

2.2.1.1 Vapour Permeance: Less than 60 ng/P•s•m² qualifying as a vapour retarder in applied thicknesses of 50 mm and greater.
2.2.1.2 Air Leakage Rate: Maximum 0.02 L/s•m² at 75 Pa
2.2.1.3 Long Term Thermal Resistance: Nominal RSI 1.0/25 mm in accordance with ULC S770
2.2.1.4 Density: Nominal 35 kg/m³ ±10% by weight.
2.2.1.5 Closed Cell Content: Minimum 95% in accordance with ASTM D2856
2.2.1.6 Ozone Depletion Potential: Zero
2.2.1.7 Global Warming Potential: Low
2.2.1.8 Volatile Organic Compounds: Zero
2.2.1.9 Acceptable Materials:

2.2.1.9.1 BASF Walltite
2.2.1.9.2 CertainTeed CertaSpray
2.2.1.9.3 Demilec Heatlok Soya
2.2.1.9.4 Icynene MD-C-200
2.2.1.9.5 JM Corbond MCS SPF
2.2.1.9.6 Lapolla Foam-LOK FL 2000

2.2.1 Thermal Barrier (Flame Spread Protection): Vermiculite-cement based fire resistant material, wet mix spray applied fireproofing meeting requirements of ULC S124, ASTM E736, ASTM E759, ASTM E761 and ASTM E859; containing no asbestos fibre, ULC labelled and listed for assemblies and fire ratings indicated on Drawings, and as follows:

2.2.1.1 Water: Potable, clean and free from injurious amounts of deleterious substances.
2.2.1.2 Damming Materials: In accordance with the tested assembly being installed as acceptable to Authorities Having Jurisdiction, and as recommended by manufacturer.

2.2.1.3 Firestopping Mortar: Cementitious, single component fire resistive mortar coating; charcoal colour, tested listed and certified by ULC.

2.2.1.4 Acceptable Materials:

2.2.1.4.1 Carboline Company, A/D Fire Protection Systems, Cementitious Thermal Barrier, Type 7TB

2.2.1.4.2 Isolatik International Inc., Cafco Industries Ltd., Blaze-Shield II

2.2.1.4.3 W.R. Grace Construction Materials, Monokote Type Z-3306

2.2.2 Equipment: Use equipment recommended by manufacturer for specific type of installation and in accordance with CAN/ULC S705.2.

2.2.3 Primer: Manufacturer’s recommended primer specific to steel and aluminum surfaces subject to forming oils or grease such as steel studs, girts, roof decks materials.

2.2.4 Accessories: Manufacturer’s recommended materials required for a complete and functioning vapour resistant, air and thermal barrier.

3 Execution

3.1 EXAMINATION

3.1.1 Examine substrates, areas, and conditions, and verify that surfaces and conditions are in accordance with manufacturer’s requirements before starting work of this Section; start of work indicates acceptance of substrates.

3.2 PREPARATION

3.2.1 Clean substrates of dirt, dust, grease, oil, loose material and other matter that may affect bond of spray applied materials.

3.2.2 If recommended by manufacturer, prime substrates in accordance with manufacturer’s instructions.

3.3 INSTALLATION

3.3.1 Spray apply insulation in accordance with manufacturer’s instructions. Use equipment recommended by manufacturer.

3.3.2 Apply material as indicated and in average thickness of not less than 75 mm for RSI 3.5 (R20) as indicated on Drawings.

3.3.3 Polyurethane foam insulation should be sprayed with tolerance of ±6 mm in relation to specified thickness.

3.3.4 When spraying polyurethane foam insulation, the formation of sub-layer air pockets to be avoided.

3.3.5 Avoid spraying foam on any surfaces other than those indicated.

3.3.6 Use drop sheets or masking tape to protect other surfaces.

3.3.7 Once the foam insulation has hardened, removed all overspray from non-prescribed surfaces.

3.3.8 Do not allow polyurethane foam insulation installation be damaged during work by other trades, unless a prior agreement has been reached.

3.3.9 Ensure subsequent coverage of applied insulating foam will be completed within manufacturer’s prescribed timeframe.

3.3.10 Polyurethane foam insulation should be sprayed in overlapping layers, so as to obtain smooth, uniform surface.
3.3.11 In cold weather when applying on flat surface of more than 15 lineal in either
direction, apply first layer in 3 m strips at 1 m intervals. After curing period (± 4
hrs.) has elapsed, spray polyurethane foam on the unfilled spaces.

3.3.12 Do not spray polyurethane foam any closer than 75 mm from chimneys, heating
vents, steam pipes, recessed lighting fixtures, and other heat sources.

3.3.13 Spray apply thermal barrier over spayed foam insulation in accordance with
manufacturer's instructions. Use equipment recommended by manufacturer.

3.4 CLOSEOUT ACTIVITIES

3.4.1 Cleaning: Perform final cleaning in accordance with Section 01 74 23 – Final
Cleaning.

3.4.2 Clean adjacent surfaces of overspray and dusting.

END OF SECTION
1 General

1.1 SUMMARY

1.1.1 This Section includes requirements for supply and installation of air and vapour membranes that prevent exfiltration and infiltration between interior and exterior of building through wall and roof transition construction under all conditions of air pressure differentials forming an integral part of the building enclosure installed intact and continuous on warm side of exterior insulated walls.

1.2 RELATED REQUIREMENTS

1.2.1 Section 03 30 00 – Cast-In-Place Concrete: Coordinate surface preparation of air and vapour membrane for application to concrete substrates.

1.2.2 Section 03 45 00 – Precast Architectural Concrete

1.2.3 Section 04 81 00 – Unit Masonry Assemblies: Coordinate sequence of installation of air and vapour membranes with unit masonry assemblies; coordinate surface preparation for air and vapour membrane application to unit masonry substrates.

1.2.4 Section 06 16 43 – Gypsum Sheathing: Coordinate surface preparation of air and vapour membrane for application to gypsum sheathing substrates.

1.2.5 Section 07 05 10 – Common Work Results for Air and Vapour Membrane and Vapour Retarder Systems: Measurement criteria for confirming air tightness and vapour pressure required to maintain building envelope.

1.2.6 Section 07 08 15 – Building Envelope Inspection and Testing

1.2.7 Section 07 21 13.13 – Semi-Rigid Board Insulation: Coordinate sequence of installation of insulation with air and vapour membranes.

1.2.8 Section 07 21 29 – Sprayed Insulation: Coordinate installation of materials providing continuation of air and vapour seals around penetrations and openings, and other locations required to form a complete building envelope.

1.2.9 Section 07 52 23 – Cold Adhesive Applied Bituminous Membrane Roofing: Coordinate compatibility of roofing transition membranes with membranes specified in this Section.

1.2.10 Section 07 62 00 – Sheet Metal Flashing and Trim: Coordination with flexible flashings and compatibility with specified air and vapour membranes.

1.2.11 Section 07 92 00 – Joint Sealants: Coordinate compatibility of joint sealants used for building envelope continuity.

1.2.12 Section 08 44 13 – Glazed Aluminum Curtain Walls: Coordinate compatibility of curtain wall transition membranes with membranes specified in this Section.

1.2.13 Section 08 63 00 – Metal Framed Skylights: Coordinate compatibility of window transition membranes with membranes specified in this Section.

1.3 REFERENCE STANDARDS

1.3.1 American Society for Testing of Materials (ASTM):

1.3.1.1 ASTM D146-04 (2012)e1, Standard Test Methods for Sampling and Testing Bitumen-Saturated Felts and Woven Fabrics for Roofing and Waterproofing

1.3.1.2 ASTM D412-06ae2, Standard Test Methods for Vulcanized Rubber and Thermoplastic Elastomers—Tension

1.3.1.4 ASTM E96/E96M-10, Standard Test Methods for Water Vapor Transmission of Materials
1.3.1.5 ASTM E283-04 (2012), Standard Test Method for Determining the Rate of Air Leakage through Exterior Windows, Curtain Walls, and Doors under Specified Pressure Differences across the Specimen
1.3.1.6 ASTM E2178-11, Standard Test Method for Air Permeance of Building Materials
1.3.1.7 ASTM E2357-11, Standard Test Method for Determining Air Leakage of Air Barrier Assemblies

1.3.2 Canadian General Standards Board (CGSB):
1.3.2.1 CAN/CGSB 37-GP-56M, Membrane, Modified, Bituminous, Prefabricated, and Reinforced for Roofing

1.4 ADMINISTRATIVE REQUIREMENTS
1.4.1 Pre-Construction Meeting: Arrange a pre-construction meeting 1 week before commencing work of this Section in accordance with Section 01 31 19 – Project Meetings to discuss installation requirements of specified air and vapour membrane systems, third party site inspections, manufacturer’s site review, and location for site constructed mock-up listed in this Section] attended by Subcontractor for work of this Section, Consultant, building envelope inspector, manufacturer’s technical representative and others affected by work of this Section.

1.4.2 Coordination: Coordinate interface of membranes specified in this Section with adjacent systems to ensure continuity of system and that junctions between various components are effectively sealed; verify with manufacturers and installers for installation procedures of materials incorporated into air and vapour membrane elements including membranes, transitions, coatings and sealants and continuity with roofing membrane.

1.5 SUBMITTALS
1.5.1 Provide required information in accordance with Section 01 33 00 – Submittal Procedures.

1.5.2 Action Submittals: Provide the following submittals before starting any work of this Section:
1.5.2.1 Product Data: Submit manufacturer’s product literature, and installation instructions required for complete and proper installation of air and vapour retarder elements including membranes, primers, fasteners, proprietary application equipment, and detailing requirements to suit specific project installation.
1.5.2.2 Samples: Submit representative sample of air and vapour membrane minimum 300 mm x 300 mm with factory applied identification clearly visible.

1.5.3 Sustainable Design Submittals: Coordinate project sustainable design requirements with Section 01 35 31 - LEED Special Project Procedures and Section 01 35 31A - LEED Material Information Sheet for LEED Submittals.

1.6 QUALITY ASSURANCE
1.6.1 Qualifications: Provide proof of qualifications when requested by Consultant:
1.6.1.1 Manufacturer: Obtain air and vapour membrane materials through one source from a single manufacturer or using materials from a secondary source that are acceptable to the manufacturer.
1.6.1.2 Installer: Use an installation company that is acceptable to the manufacturer, using workers who are trained and approved by the membrane manufacturer having experience with projects of similar complexity and area.

1.7 MOCK-UP

1.7.1 Provide required Sample Installation in accordance with Section 01 45 00 – Quality Control, and as follows:

1.7.1.1 Install minimum ten (10) m² of typical and representative air and vapour retarder system, in location on site directed by Consultant.

1.7.1.2 Mock-up is required to demonstrate interface with other materials and details including wall to roof, window and door openings, penetrations and base of wall.

1.7.1.3 Allow three (3) working days for review of mock-up by Consultant and roofing inspector, manufacturer’s technical representative.

1.7.1.4 Make revisions to mock-ups or perform additional work as directed by Consultant; acceptable mock-up can form a part of the finished work; remove unacceptable materials and reinstall mock-up for acceptance by Consultant.

1.8 DELIVERY, STORAGE AND HANDLING

1.8.1 Delivery and Acceptance Requirements: Deliver materials to job site in original unopened packages, clearly marked with manufacturer's name, material brand name and description of contents.

1.8.2 Storage and Handling Requirements: Protect membrane materials before, during and after installation in accordance with manufacturer’s requirements for weight, temperature, heat and flame, and humidity; store liquid materials in their original undamaged containers in a clean, dry, protected location and within the temperature range required by membrane manufacturer.

1.9 SITE CONDITIONS

1.9.1 Ambient Conditions: Apply air and vapour membrane to substrate surfaces that are within manufacturer’s installation temperature threshold range accounting for wind cooling and apparent temperature when actual temperature is approaching manufacturer’s minimum temperature threshold.

1.10 WARRANTY

1.10.1 Manufacturer’s Warranty: Submit manufacturer's warranty stating that air and vapour membranes and accessories are free of defects and are manufactured to meet manufacturer's published physical properties and material specifications as of the date of product delivery.

1.10.2 Installer’s Warranty: Submit installers warranty stating that air and vapour membranes and accessories are installed in accordance with manufacturer's recommendations and that membrane, transitions and through-wall flashing membranes, primers, mastics, adhesives and sealants are sourced from one manufacturer.

2 Products

2.1 MANUFACTURERS

2.1.1 Acceptable Materials Manufacturers: Subject to compliance with requirements specified in this Section; where multiple listings of manufacturers occur, use any of the following listed manufacturers' products in accordance with Section 01 62 00 – Product Options including the following:

2.1.1.1 Bakor Inc. (Henry Canada)
2.1.1.2 Grace Construction Materials
2.1.1.3 Soprema Canada
2.1.1.4 Tremco Commercial Sealants and Waterproofing
2.1.1.5 W. R. Meadows Inc.

2.1.2 Substitutions: Consultant may consider additional manufacturers having similar products to Acceptable Materials Manufacturers listed above during the construction period, provided they meet the performance requirements established by the named products and provided they submit requests for substitution in accordance with Section 01 25 00 – Substitution Procedures before starting any work of this Section:

2.1.2.1 Do not use substitute materials to establish Bid Price.
2.1.2.2 Substitutions that appear as a part of the project without review and acceptance by the Consultant will be rejected, and replaced with one of the specified materials.

2.2 PERFORMANCE REQUIREMENTS

2.2.1 Provide materials and installations that meet the following material and assembly performance ratings as required by Section 07 05 10, and as follows:

2.2.1.1 Material Performance: Provide materials having an air permeance rating not exceeding 0.02 l/sec-m² measured at 75 Pa pressure differential in accordance with ASTM E2178; and having a vapour permeance rating not exceeding 3.5 g/sec-m² in accordance with ASTM E96.

2.2.1.2 Assembly Performance: Install materials and accessories to provide a continuous air and vapour membrane assembly having an air leakage rate not exceeding 0.20 l/sec-m² measured at 75 Pa pressure differential in accordance with ASTM E2357; that will perform as the primary drainage plane flashed to direct condensation or water penetration to the exterior; that will accommodate movement of building materials and building expansion and contraction; and that has appropriate accessory materials to account for changes in substrate, transitions and other perimeter conditions.

2.2.1.3 Low Temperature Performance: Modify acceptable material listings and provide manufacturer’s low temperature or ultra-low temperature membrane products when installation conditions are scheduled to occur at or below installation temperature range of specified materials.

2.3 AIR AND VAPOUR MEMBRANE ASSEMBLY

2.3.1 Primers and Undercoats: Manufacturer’s recommended primer or surface conditioner to improve bond between membranes to substrates having VOC content meeting or less than required for project sustainability requirements.

2.3.2 Liquid Applied Membrane: Single component, liquid applied elastomeric bituminous or synthetic rubber coating, trowel or spray applied [free of VOC’s that could affect project sustainability requirements]; having low temperature formulation appropriate for installation requirements; tested in accordance with ASTM E96 and ASTM E2178, and having the following nominal properties:

2.3.2.1 Low Temperature Flexibility: Less than -20°C
2.3.2.2 Nominal Thickness: 1.0 to 1.5 mm cured film thickness
2.3.2.3 Acceptable Materials:
   2.3.2.3.1 Bakor Air-Bloc 32
   2.3.2.3.2 Grace Perm-A-Barrier Liquid
   2.3.2.3.3 Soprema Sopraseal LM 200 S
   2.3.2.3.4 Tremco ExoAir 120
   2.3.2.3.5 W. R. Meadows Air-Shield LM
2.3.3 Through Wall Flashing Membranes: Self adhering SBS modified bitumen reinforced membrane with cross-linked polyethylene skins, specifically manufactured for use as through wall flashing or dampproofing course; and having the following nominal properties:

2.3.3.1 Service Temperature Range: -40°C to +80°C
2.3.3.2 Thickness: 1.0 mm
2.3.3.3 Acceptable Materials:
   2.3.3.3.1 Bakor Blueskin TWF
   2.3.3.3.2 Grace Perm-A-Barrier Wall Flashing
   2.3.3.3.3 Soprema Sopraseal Stick 130-S
   2.3.3.3.4 Tremco ExoAir TWF
   2.3.3.3.5 W.R. Meadows Air-Shield Thru-Wall Flashing

2.4 ACCESSORIES

2.4.1 Waterproofing Mastic: Manufacturer’s recommended trowel applied waterproofing mastic containing compatible modified bitumen, fibres and mineral fillers having VOC content meeting or less than required for project sustainability requirements.

2.4.2 Panel Sheathing Tape: Manufacturer’s recommended self adhering tape compatible with liquid applied air and vapour membranes specified in this Section.

2.4.3 Roof-to-Wall Transition Membranes: Manufacturer’s recommended reinforced self adhesive, torch grade membrane where required, compatible with roofing air and vapour membranes and wall materials specified in this Section.

2.4.4 Opening Transition Membranes: Manufacturer’s recommended reinforced, self adhesive membrane compatible with adjacent materials, and air and vapour membranes specified in this Section.

2.4.5 Through Wall Membranes: Manufacturer’s recommended reinforced self adhesive, compatible with air and vapour membrane and that will not become plastic and extrude onto finished surfaces when exposed to high wall temperatures; coordinate with Section 04 81 00 for through wall masonry membranes and flashings.

2.4.6 Insulation Adhesive: Manufacturer’s recommended trowel applied adhesive compatible with membrane system and insulation.

3 Execution

3.1 EXAMINATION

3.1.1 Examine conditions of substrates and other conditions affecting this Section before starting work; notify other related trades and verify that substrates are complete and ready for installation of products specified in this Section.

3.2 PREPARATION

3.2.1 Prepare surfaces in accordance with manufacturer’s written requirements for type of substrate; free from voids, spalled areas, loose aggregates or sharp points; clean surfaces to remove contaminants that could affect bond such as grease or wax, dust, dirt and debris [and as follows:

3.2.1.1 Exterior Gypsum Sheathing Panels: Verify that boards are sufficiently stabilized with corners and edges fastened with appropriate screws; pre-treat board joints with reinforced self adhesive tape or fibreglass mesh tape; fill gaps wider than 6 mm with mastic or sealant and allow sufficient time to fully cure before applying tape and liquid applied membrane.
3.2.1.2 Masonry Substrates: Apply air and vapour barrier membranes to masonry substrates having smooth flush mortar joints; fill voids and holes with lean mortar mix, non-shrinking grout or parge coat.

3.2.1.3 Adjacent Materials: Treat construction joints and install flashings as recommended by manufacturer.

3.2.2 Apply primer to substrates when required by manufacturer at rate recommended by manufacturer; cover primed substrates on same day, reapply primer when work cannot be completed on the same day.

3.3 INSTALLATION

3.3.1 Install air and vapour membranes in accordance with manufacturer’s written requirements, using appropriate equipment and skilled workers and as follows:

3.3.1.1 Holes and Tears: Repair holes and tears with compatible membrane materials; overlap affected surface area by a minimum of 100 mm and seal edges of repair with manufacturer’s recommended mastic material.

3.3.1.2 Transition Membranes: Connect air and vapour membranes to adjacent assemblies having pre-installed transition membranes at openings and other assemblies; install transition membranes where required to maintain continuity of building envelope.

3.3.1.3 Corner Details and Protrusions: Cover inside corners and protrusions, centred and installed in direct contact with the substrate with no voids under the membrane strip; reinforce outside corners by double lapping or stripping as required by membrane manufacturer.

3.3.1.4 Through Wall and Flexible Flashings: Install flexible membranes where required to maintain flow direction to divert water away from face of building envelope.

3.3.2 Separate air and vapour membranes from incompatible materials, and provide manufacturer’s recommended transition materials required to maintain continuity of building envelope.

3.3.3 Inspect membrane installation at end of each day of work and before installation of insulation; seal upper edge of membrane with mastic at end of day’s work when precipitation is anticipated or when work is expected to be delayed or interrupted by more than one day.

3.4 SITE QUALITY CONTROL

3.4.1 Allow access for inspection and testing of installed air and vapour membranes, and repair of deficiencies before placement of insulation materials.

3.4.2 Site Testing and Inspection: Inspection and testing fees will be paid [by the Owner in accordance with Section 01 45 00 – Quality Control in accordance with Section 07 08 15; notify Consultant a minimum of five (5) days in advance of when assemblies will be ready for inspection and testing and as follows:

3.4.2.1 Building envelope inspector will arrange for a pre-installation meeting attended by the Consultant, Subcontractor, manufacturer’s technical personnel and other subcontractors affected by the work of this Section.

3.4.2.2 Consultant will make a visual inspection only.

3.4.2.3 Cooperate with building envelope inspector and Consultant; repair or replace air and vapour membrane system as directed by Consultant.
3.4.3 Manufacturer’s Site Services: Arrange for air and vapour membrane manufacturer’s technical personnel to review building envelope during installation as follows:

3.4.3.1 Provide training and supervision of personnel who will install membrane systems and coordinate other subcontractors affected by work of this Section

3.4.3.2 Provide frequent visits during the progress of the work to assure quality and competence of membrane installation in accordance with manufacturer’s instructions

3.4.3.3 Verify surface conditions prior to installation to

3.4.3.4 Verify that workmanship requirements are being met during installation and to provide technical assistance and installation guidance as necessary to ensure a complete and continuous membrane assembly

3.4.3.5 Verify that installation meets requirements of manufacturer’s warranty after completion of membrane system

3.4.3.6 Submit written report of site activities, directions for correction of installed membranes, detailing and any special installation requirements resulting from site conditions different than manufacturer’s standard details

3.4.4 Post Construction Testing:

3.4.4.1 Owner reserves the right to engage a testing firm to perform air and vapour retarder testing to confirm performance of installed membranes and insulation systems in accordance with Section 01 45 00; testing will be performed when the building mechanical systems are balanced and operating; when building is occupied and climatic conditions are suitable for infrared thermographic scan of the building.

3.4.4.2 Cooperate with building envelope testing agency; repair or replace air and vapour membrane system as directed by testing agency.

3.4.5 Non-Conforming Work: Repair or replace non-conforming work at no additional expense to the Project.

3.5 CLOSEOUT ACTIVITIES

3.5.1 Protection: Protect membrane as recommended by manufacturer from effects of long term exposure where membrane is open to the environment for prolonged time periods using opaque plastic sheets or tarpaulins; protect membrane from penetrations and damage by successive components of the Work; assign payment for repairs to responsible parties; make repairs in accordance with manufacturer’s written instructions using original installers.

3.5.2 Cleaning: Remove masking materials, debris, excess materials and equipment from site at completion of the work; conduct ongoing daily cleaning as directed by the Construction Manager; clean stains, drips or spills of coatings, sealants, mastic or primers visible on finished surfaces.

END OF SECTION
1 General

1.1 SUMMARY

1.1.1 This Section includes requirements for supply and installation of the following cladding systems (Wall Type WT-11a, WT-11b, WT-11c, WT-18, WT-31a, WT-31b, WT-31c, WT-32, WT-33, and WT-34):

1.1.1.1 Profiled steel cladding forming a part of an exterior wall system with a system of girts, insulation and air/vapour retarder, flashings and trims using prefinished sheet materials and exposed fasteners.

1.1.2 Provide specified system with labour, materials, and equipment required to fabricate and erect cladding including cutting and penetrations, accessories, flashings, trims and closures necessary for a complete installation.

1.2 RELATED REQUIREMENTS

1.2.1 Section 01 33 50 – Delegated Design Submittals
1.2.2 Section 05 41 13 – Wind Load Bearing Steel Stud Framing: Metal studs, bracing, anchorage, and framing accessories
1.2.3 Section 06 16 43 – Gypsum Sheathing
1.2.4 Section 07 21 13 – Board Insulation
1.2.5 Section 07 25 13 – Air and Vapour Membranes
1.2.6 Section 07 62 00 – Sheet Metal Flashing and Trim: Metal flashing and trim not part of this Work.
1.2.7 Section 07 92 00 – Joint Sealants: Site applied sealants

1.3 REFERENCE STANDARDS

1.3.1 American Society for Testing and Materials (ASTM):

1.3.1.1 ASTM A653/A653M-11, Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process
1.3.1.2 ASTM A755/A755M-04a, Standard Specification for Steel Sheet, Metallic Coated by the Hot-Dip Process and Prepainted by the Coil-Coating Process for Exterior Exposed Building Products

1.3.2 Canadian Sheet Steel Building Institute (CSSBI):

1.3.2.1 CSSBI 20M-99, Standard for Sheet Steel Cladding for Architectural, Industrial and Commercial Building Applications
1.3.2.2 CSSBI S8-2007, Quality and Performance Specification for Prefinished Sheet Steel Used for Building Products

1.3.3 Canadian Standards Association (CSA):

1.3.3.1 CSA CAN/CSA S16-09, Limit States Design of Steel Structures
1.3.3.2 CSA S136-12, North American Specification for the Design of Cold-Formed Steel Structural Members and Commentary

1.3.4 Canadian General Standards Board (CGSB):

1.3.4.1 CGSB 1.108-M89, Bituminous Solvent Type Paint
1.4 ADMINISTRATIVE REQUIREMENTS

1.4.1 Coordination: Coordinate work of this section with the requirements of Section 07 62 00, for specific requirements for supply of prefinished sheet metal flashing materials to other sections of the work and as follows:

1.4.1.1 Supply prefinished sheet metal flashings required for the project, regardless of sheet metal thickness and colour.

1.4.1.2 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.

1.4.1.3 Coordinate with installing trades during bid period and provide unit prices for materials based on specified thickness and colour of flashing materials required under their respective scopes of work; installing trades will be responsible for carrying cost for flashing materials in their scope of work in their Bid Price.

1.4.1.4 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).

1.4.1.5 Trade Contractor 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.

1.4.2 Pre-Construction Meetings:

1.4.2.1 Convene one (1) week before commencing Work of this Section to discuss expectations for fit and finish of wall system, quality of workmanship for installation of air/vapour retarders and insulation and relationship of wall system to adjacent components.

1.4.2.2 Meeting shall be attended by the installer, manufacturer’s representative, Construction Manager and the Consultant.

1.4.2.3 Manufacturer’s representative shall also provide frequent inspection visits during the course of work of this Section to assure quality and competence of membrane installation and panel alignment.

1.5 SUBMITTALS

1.5.1 Provide required information in accordance with Section 01 33 00 – Submittal Procedures.

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

1.5.2.1 Product Data: Submit manufacturer’s product data, standard details, certified product test results, and general recommendations, as applicable to materials and finishes for each component and for total panel assemblies.

1.5.2.2 Shop Drawings:

1.5.2.2.1 Submit shop drawings indicating layouts of panels, details of corner conditions, joints, panel profiles, supports, anchorages, trim, flashings, closures, and special details, distinguishing between factory and site assembled work.

1.5.2.2.2 Include structural analysis data signed and sealed by a professional engineer responsible for their preparation of shop drawings for installed products indicated to comply with design loadings listed in 2.1.3 below.
1.5.2.3 Samples: Submit samples of materials as follows:

1.5.2.3.1 Provide sample cladding 300 mm long x actual panel width in specified profile, style, colour, and texture including clips, caps, battens, fasteners, closures, and other exposed panel accessories for verification and acceptance by the Consultant.

1.5.3 Informational Submittals: Provide the following submittals during the course of the work:

1.5.3.1 Letters of Commitment and Compliance: Provide documents prepared by the delegated design professional engineer as recommended by APEGAs Responsibilities for Engineering Services for Building Projects in accordance with Section 01 33 50 – Delegated Design Submittals.

1.5.4 Sustainable Design Submittals: Coordinate project sustainable design requirements with Section 01 35 31 - LEED Special Project Procedures and Section 01 35 31A - LEED Material Information Sheet for LEED Submittals, including the following:

1.5.4.1 A Design Service Life (DSL) of 50 years has been selected for the New Central Library. Submit a letter from the manufacturer confirming that the metal panels will have a Predicted Service Life (PSL) of at least half of the life of the building.

1.6 PROJECT CLOSEOUT SUBMISSIONS

1.6.1 Operation and Maintenance Data: Submit manufacturer’s written instructions for repair and cleaning procedures, include name of original installer and contact information in accordance with Section 01 78 23 – Operation and Maintenance Data.

1.7 QUALITY ASSURANCE

1.7.1 Qualifications: Provide proof of qualifications during the course of the work of this Section:

1.7.1.1 Installer: Engage an experienced installer having a minimum of five (5) years experience who has completed metal wall cladding projects similar in material, design, and extent to that indicated for this Project and with a record of successful in-service performance.

1.8 DELIVERY, STORAGE AND HANDLING

1.8.1 Delivery and Acceptance Requirements:

1.8.1.1 Package materials for protection against damage during transportation or handling.

1.8.1.2 Deliver materials so they will not be damaged or deformed.

1.8.2 Storage and Handling Requirements:

1.8.2.1 Exercise care in unloading, storing, and erecting wall system to prevent bending, warping, twisting, and surface damage.

1.8.2.2 Stack materials on platforms or pallets, covered with tarpaulins or other suitable weather tight and ventilated covering, maintaining wall system in a dry condition.

1.8.2.3 Do not store materials in contact with other materials that might cause staining, denting, or other surface damage.
1.9 SITE CONDITIONS

1.9.1 Site Measurements: Verify dimensions including structural members and openings in substrates by site measurements before fabrication and indicate measurements on shop drawings where metal wall cladding are indicated to fit between or around other construction; coordinate fabrication schedule with construction progress to avoid delaying the Work.

1.9.2 Established Dimensions: Where site measurements cannot be made without delaying the Work, either establish opening dimensions and proceed with fabricating wall system without site measurements or allow for trimming panel units on site, coordinate wall construction to ensure actual locations of structural members and to ensure opening dimensions correspond to established dimensions.

2 Products

2.1 ACCEPTABLE FABRICATORS

2.1.1 Basis-of-Design Products: Products named in this Section were used as the basis-of-design for the project; manufacturers listed as additional acceptable materials 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.

2.1.1.1 Basis-of-Design Manufacturer: Vicwest

2.1.2 Additional Acceptable Products Manufacturers: Subject to matching of colour and compliance with performance requirements specified in this Section; as established by the Basis-of-Design Products, use any of the listed manufacturers’ products in accordance with Section 01 62 00 – Product Options; following manufacturer’s do not require submission of a request for substitutions provided required shop drawing and product data submissions are submitted before starting any work of Section:

2.1.2.1 Behlen Industries LP
2.1.2.2 Custom Metal Contracting Ltd.
2.1.2.3 Gentek Building Products Limited
2.1.2.4 Igloo Erectors Ltd.
2.1.2.5 IMARK Inc. Metal roofing and Wall Systems
2.1.2.6 Proclad Enterprises Ltd.
2.1.2.7 Thermal Systems KWC Ltd.

2.1.3 Substitutions: Consultant may consider additional manufacturers having similar products to Acceptable Materials Manufacturers listed above during the construction period, provided they meet the performance requirements established by the named products and provided they submit requests for substitution in accordance with Section 01 25 00 – Substitution Procedures before starting any work of this Section:

2.1.3.1 Do not use substitute materials to establish Bid Price.
2.1.3.2 Substitutions that appear as a part of the project without review and acceptance by the Consultant will be rejected, and replaced with one of the specified materials.
2.2 PERFORMANCE CRITERIA

2.2.1 Maximum deflection not to exceed L/180 under system's own weight plus wind load (positive and negative) loads acting normal to the plane in accordance with the Building Code Climatic Data, wind load 1:30 years.

2.2.2 Design sheet cladding to span continuously over at least four structural supports (three spans) and design fastening to structural supports to sustain factored loads in accordance with CSA S136 and CAN3 S157.

2.2.3 Calculate live load deflections in accordance with CSSBI 20M, as modified by the requirements of this Section.

2.2.4 Provide for movement of components without causing buckling, failure of joint seals, undue stress on fasteners when subject to seasonal temperature range from -40°C to +50°C, and wind loads noted in 2.2.1 above.

2.2.5 Include expansion joints to accommodate movement in wall system and between wall system and building structure, where these movements are caused by deflection of building structure, and accommodate these movements, without permanent distortion, damage to infills, racking of joints, breakage of seals, or water penetration.

2.2.6 Provide for positive drainage to the exterior of all water entering or condensation occurring within the system.

2.2.7 Final review and acceptance of work completed by this Section shall be carried out by the manufacturer's representative, the Consultant, Construction Manager and the Trade Contractor.

2.3 CLADDING MATERIALS

2.3.1 Zinc Galvanized Sheet Steel Cladding: Tension levelled, Commercial Steel (CS) designation, Type A, Grade 230 (33) in accordance with ASTM A653/A653M and as follows:

2.3.1.1 Thickness: Minimum 0.84 mm base metal thickness, or thicker as required to meet design loads.

2.3.1.2 Galvanizing Designation: Z275 (G90) applied evenly to both sides.

2.3.1.3 Metal Cladding (M-1):

2.3.1.3.1 Profile: Metal To match Vic West CL840 having nominal 935 mm panel c/c with 40 mm wide raised rib at 134 mm c/c

2.3.1.3.2 Surface Texture: Smooth

2.3.1.3.3 Prefinished custom colour using Silicone Modified Polyester Valspar Weather XL.

2.4 FINISHES

2.4.1 Coil Coated Materials: Prefinished materials coated to film thickness as recommended by coating manufacturer, and designed specifically for vertical surfaces to 30° from vertical, and horizontal surfaces 5° up to 60° from horizontal, acceptable colours and materials as listed in 2.1 above, and in accordance with ASTM A755.

2.5 SYSTEM COMPONENTS

2.5.1 Panel Support System: Thermally Isolated ‘Z’ Girt System complete with continuous horizontal track and as follows:

2.5.1.1 Z-Girts designed to accommodate insulation depth and allow full thermal expansion and contraction of sheet; cold-rolled, commercial grade structural quality sheet steel (SS), minimum 1.519mm base metal thickness; zinc-coated to ASTM A653/A653M, coating designation Z275.
2.5.1.2 Design thermally improved cladding support systems to provide Continuous Insulation R-Value retaining a minimum of 80% Rated R-Value indicated for opaque wall areas.

2.5.1.3 Design thermally improved cladding support system to account for thermal movement of local climate with a minimum of 60°C ambient or cladding panel temperature fluctuations, without causing undue stress on fasteners or panel or other detrimental effects.

2.5.1.4 Design thermally improved cladding support system as a complete system to accommodate structural movement in wall system and between wall system and building structure, without permanent distortion, damage to infill materials, or racking of joints.

2.5.1.5 Design thermally improved cladding support system members and suspension system to withstand gravity load, live loads and negative loads calculated in accordance with the Building Code.

2.5.2 Isolation Tape: Manufacturers standard material for separating dissimilar metals from direct contact.

2.5.3 Flashing, Trim and Enclosure: Core material, thickness, and finish to match cladding material.

2.5.4 Fasteners: Non-corrosive fasteners as recommend by panel manufacturer, and as follows:

2.5.4.1 Attachment panel system to primary panel structural supports using manufacturer’s recommended concealed fasteners.

2.5.4.2 Use exposed fasteners for typical joinery.

2.5.4.3 Obtain Consultant’s acceptance where exposed fasteners are required in isolated conditions; Consultant will permit a limited number of exposed fasteners obscured within panel joinery using stainless steel fastenings, or in the face of panels using colour matched fastenings.

2.5.5 Insulation Fastenings: Corrosion resistant, galvanized bugle head screws with 38 mm diameter washer, 25 mm minimum penetration into wall framing.

2.5.6 Closure Strips: Closed cell, self extinguishing, expanded, cellular, rubber or cross linked, polyolefin foam flexible closure strips, cut or pre-moulded to match configuration of cladding to maintain weather tight construction.

2.5.7 Sealing Tape: Pressure-sensitive, 100% solids, polyisobutylene compound sealing tape with release paper backing; permanently elastic, non-sag, non-toxic, non-staining.

2.5.8 Sealant: One-part elastomeric polyurethane, polysulphide, or silicone rubber sealant as recommended by panel manufacturer in accordance with Section 07 92 00, type as recommended by manufacturer for specific end use, colour to match cladding where exposed.

2.5.9 Insulation: As specified in Section 07 21 13.13

2.5.10 Air and Vapour Membrane: As indicated in Section 07 25 13

2.5.11 Accessorries: Provide components required for a complete wall cladding assembly including trim, copings, fasciae, mullions, sills, corner units, clips, seam covers, flashings, louvers, sealants, gaskets, fillers, closure strips, and similar items; to match materials and finishes of panels.
2.5.12 Bituminous Coating: Cold-applied asphalt mastic, in accordance with CGSB 1.108, compounded for 0.40 mm dry film thickness per coat with inert type non-corrosive compound free of asbestos fibres, sulphur components, and other deleterious impurities.

2.6 FABRICATION

2.6.1 Fabricate and finish cladding, and accessories at the factory to greatest extent possible using manufacturer’s standard procedures and processes, and conforming to indicated profiles and with dimensional and structural requirements.

2.6.2 Fabricate cladding true, plumb and square, with no oil-canning or deformity that detracts from aesthetic appearance.

2.6.3 Apply bituminous coating or other permanent separation materials on concealed panel surfaces where cladding will be in direct contact with substrate materials that are not compatible or could result in corrosion or deterioration of either materials or finishes.

3 Execution

3.1 EXAMINATION

3.1.1 Obtain dimensions from project site before fabricating wall system.

3.1.2 Examine substrates and conditions for conditions affecting performance of metal panel walls and correct unsatisfactory conditions, or notify Construction Manager for correction of conditions not controlled by this Section.

3.1.3 Do not proceed with wall panel installation until unsatisfactory conditions have been corrected.

3.1.4 Inspect wall system and components before installation and verify that there is no shipping damage.

3.1.5 Do not install damaged panels; repair or replace as required for smooth and consistent finished appearance.

3.2 PREPARATION

3.2.1 Coordinate metal wall system installation with rain drainage work; flashing; trim; and construction of soffits, roofing, parapets, walls, and other adjoining work to provide a leak-proof, secure, and non-corrosive installation.

3.2.2 Promptly remove protective film, if any, from exposed surfaces of metal panels. Strip with care to avoid damage to finish.

3.2.3 Install girts, angles, and other secondary structural panel support members and anchorage according to reviewed shop drawings and manufacturer’s written instructions.

3.2.4 Install air and vapour retarder membrane, and insulation in accordance with requirements of Section 07 25 13.

3.3 CLADDING INSTALLATION

3.3.1 Comply with panel manufacturer’s written instructions and recommendations for installation, as applicable to project conditions and supporting substrates.

3.3.2 Anchor wall system and other components of the work securely in place, with provisions for thermal and structural movement, and as follows:

3.3.2.1 Site cutting exterior cladding by torch is not permitted.

3.3.2.2 Install cladding with exposed exterior and interior fasteners, prefinished to match panel finishes.
3.3.2.3 Locate and space exposed fasteners in true vertical and horizontal alignment. Use proper tools to obtain controlled, uniform compression for positive seal without rupture of neoprene washer.

3.3.3 Install accessories as required for a complete wall panel assembly including trim, copings, fasciae, mullions, sills, corner units, clips, seam covers, flashings, louvers, sealants, gaskets, fillers, closure strips, and similar items.

3.3.4 Joint Sealers: Install gaskets, joint fillers, and sealants where indicated and where required for weatherproof performance of wall panel assemblies of types indicated or, if not otherwise indicated, types recommended by panel manufacturer and as follows:

3.3.4.1 Flash and seal cladding at ends and intersections with other materials with rubber, neoprene, or other closures to exclude weather.

3.3.4.2 Seal panel end laps with a bead of tape or sealant, full width of panel.

3.3.4.3 Seal side joints where recommended by panel manufacturer.

3.3.4.4 Prepare joints and apply sealants to comply with requirements of Section 07 92 00.

3.3.5 Wall cladding: Apply elastomeric sealant continuously between metal base channel (sill angle) and concrete, as required for waterproofing in accordance with sealant manufacturer's written instructions, and as follows:

3.3.5.1 Align bottom of wall cladding and fasten with blind rivets, bolts, or self-tapping screws.

3.3.5.2 Fasten flashings and trim around openings and similar elements with self-tapping screws.

3.3.5.3 Install screw fasteners with power tools having controlled torque adjusted to compress neoprene washer tightly without damage to washer, screw threads, or panels.

3.3.5.4 Install screws in predrilled holes.

3.3.5.5 Provide weatherproof escutcheons for pipe and conduit penetrating exterior walls.

3.3.6 Separate dissimilar metals by painting each metal surface in area of contact with a bituminous coating or by other permanent separation as recommended by manufacturers of dissimilar metals.

3.3.7 Remove temporary protective coverings and strippable films, if any, as soon as each panel is installed.

3.3.8 Installation Tolerances: Shim and align cladding system within installed tolerance of 6 mm in 6100 mm on level, plumb, and location lines as indicated, and within 3 mm offset of adjoining faces and of alignment of matching profiles.

3.4 SITE QUALITY CONTROL

3.4.1 Manufacturer’s representative, Construction Manager and Consultant shall carry out final inspection and approval of completed Work.

3.5 NON-CONFORMING WORK:

3.5.1 Damaged Units: Replace cladding and other components of the Work that have been damaged or have deteriorated beyond successful repair by finish touch-up or similar minor repair procedures.

3.6 CLEANING AND PROTECTION

3.6.1 Cleaning: On completion of panel installation, clean finished surfaces following instructions of cladding manufacturer and maintain in a clean condition during construction.

END OF SECTION
1 General

1.1 SUMMARY

1.1.1 This Section includes requirements for an aluminum composite panel assembly and forming an integrated rain screen assembly vented horizontally and vertically including; but not limited to, the following:

1.1.1.1 Exterior Panel Cladding: Anchorages, shims, furring, fasteners, girts, flashings, adapters, insulation, air and vapour membrane, and closures.

1.1.1.2 Curtain wall panel inserts for exterior and interior

1.1.1.3 Accessory Cladding: Sills, borders and fillers integral to the panel system and required for a complete assembly.

1.2 RELATED REQUIREMENTS

1.2.1 Section 05 41 13 – Wind Load Bearing Steel Stud Framing: Coordinate size and type of fastenings to suit substrate materials.

1.2.2 Section 07 21 13.13 – Semi-Rigid Board Insulation

1.2.3 Section 07 25 13 – Modified Bituminous Air and Vapour Membranes: Transition membranes and flashing components to adjacent construction.

1.2.4 Section 07 62 00 – Sheet Metal Flashing and Trim: Metal flashing and trim, rainwater gutters and leaders not forming part work of this Section.

1.2.5 Section 07 92 00 – Joint Sealants: Site applied sealants and preformed transition sealants.

1.2.6 Section 08 44 13 – Glazed Aluminum Curtain Walls

1.3 REFERENCE STANDARDS

1.3.1 American Architectural Manufacturer’s Association (AAMA):

1.3.1.1 AAMA 508-07, Voluntary Test Method and Specification for Pressure Equalized Rain Screen Wall Cladding Systems

1.3.1.2 AAMA 2605-11, Voluntary Specification, Performance Requirements and Test Procedures for Superior Performing Organic Coatings on Aluminum Extrusions and Panels

1.3.2 American National Standards Institute (ANSI):

1.3.2.1 ANSI H35.1/H35.1M-2009, Standard Alloy and Temper Designation Systems for Aluminum

1.3.3 American Society for Testing of Materials (ASTM):

1.3.3.1 ASTM A653/A653M-11, Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process

1.3.3.2 ASTM B209-10, Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate

1.3.3.3 ASTM C393/C393M-11e1, Standard Test Method for Flexural Properties of Sandwich Constructions by Beam Flexure

1.3.4 Canadian General Standards Board (CGSB):

1.3.4.1 CGSB 1.108-M89, Bituminous Solvent Type Paint

1.3.5 Underwriters Laboratories Canada (ULC):

1.3.5.1 CAN/ULC S102-10, Method of Test for Surface Burning Characteristics of Building Materials and Assemblies

1.3.5.2 CAN4 S114-05, Test for Determination of Non-Combustibility in Building Materials
1.3.5.3 CAN/ULC S134-92 (R1998), Standard Method of Fire Test of Exterior Wall Assemblies

1.4 ADMINISTRATIVE REQUIREMENTS

1.4.1 Coordination: Coordinate work of this Section with work of other sections that may have items supported by or built into aluminum composite panel assemblies including; but not limited to, supports and connectors to structure, doors and windows, mechanical and electrical penetrations, erection tolerances and as follows:

1.4.1.1 Pricing: Coordinate with other Sections of the Work during bid period and provide unit prices for materials based on specified thickness and colour of flashing materials required under their respective scopes of work; installing trades will be responsible for carrying cost for flashing materials in their scope of work in their Bid Price.

1.4.1.2 Flashings for Other Work of the Contract: Coordinate work of this section with requirements of Section 07 62 00 for supply of prefinished sheet metal flashing materials to other Sections of the Work with installation by other Sections of the Work as follows:

1.4.1.2.1 Supply prefinished sheet metal flashings required for the project in sheet metal thickness and colour specified in this Section.

1.4.1.2.2 Provide prefinished sheet metal flashings tension levelled and guillotine sheared to length ready for brake forming, fabrication and installation.

1.4.2 Pre-Construction Meetings: Include required participants and an outline agenda for meeting in accordance with Section 01 31 19 – Project Meetings and as follows:

1.4.2.1 Meeting Time: Arrange meeting before starting work in this Section to discuss expectations for fit and finish of aluminum composite panel assemblies, quality of workmanship for installation of air and vapour retarders and transitions, continuity of insulation and relationship of panel system to adjacent components.

1.4.2.2 Participants: Arrange for attendance by Construction Manager Trade Contractor for this Section; Trade Contractors of affected components of the Work, manufacturer’s representative and Consultant.

1.5 SUBMITTALS

1.5.1 Provide required information in accordance with Section 01 33 00 – Submittal Procedures.

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

1.5.2.1 Shop Drawings: Submit shop drawings indicating attachment methods, joinery for joint layout, sealing methods and accommodation of thermal movement, drawing at a minimum half full size.

1.5.2.2 Samples for Initial Selection: Manufacturer’s colour charts or chips showing the full range of colors, textures, and patterns available for panels with factory applied finishes.

1.5.2.3 Samples for Verification: Submit the following samples:

1.5.2.3.1 Panels: Submit two (2) -75 mm x 125 mm chip for custom colour approval before ordering material.

1.5.2.3.2 Accessories: Submit one (1) sample of clips, caps, battens, fasteners, closures, and other exposed panel accessories used in the final panel assembly.
1.5.3 Informational Submittals: Provide the following submittals when requested by the Consultant:

1.5.3.1 Certificates: Submit qualification statement or certificate stating that fabricator and installer are approved by manufacturer and have the necessary tools, equipment and expertise to undertake work specified in this Section; include lists of completed projects with project names and addresses, names and addresses of consultants and owners indicating range of experience.

1.5.3.2 Source Quality Control Submittals: Submit product test reports indicating compliance of manufactured panel assemblies and materials with performance and other requirements based on comprehensive testing of current products.

1.5.3.3 Site Quality Control Submittals: Submit written inspection report indicating compliance with manufacturers requirements for installation and system requirements.

1.5.3.4 Submit authorized documentation stating conformation to CAN/ULC S102, CAN/ULC S114, and CAN/ULC S134.

1.5.4 Sustainable Design Submittals: Coordinate project sustainable design requirements with Section 01 35 31 - LEED Special Project Procedures and Section 01 35 31A - LEED Material Information Sheet for LEED Submittals, including the following:

1.5.4.1 A Design Service Life (DSL) of 50 years has been selected for the New Central Library. Submit a letter from the manufacturer confirming that the metal panels will have a Predicted Service Life (PSL) of at least half of the life of the building.

1.6 QUALITY ASSURANCE

1.6.1 Regulatory Requirements: Provide panels that are listed and labelled in accordance with CAN/ULC S102, CAN/ULC S114 and CAN/ULC S134 for fire endurance and flame spread testing.

1.6.2 Qualifications: Provide proof of qualifications when requested by Consultant:

1.6.2.1 Manufacturer: Use a manufacturer that has completed panel assemblies having similar extent and complexity as required for the Work of this Contract.

1.6.2.2 Installers: Use experienced installers having experience with panel projects similar in material, design and extent as required for Work of this Contract with a record of successful in-service performance.

1.6.2.3 Delegated Design Professional Engineer: Retain a professional engineer, registered in the province of the Work, to design fabrication and erection of the Work of this Section in accordance with applicable Building Code and Contract Documents requirements including; but not limited to, the following:

1.6.2.3.1 Seal and signature to shop drawings and design submittals

1.6.2.3.2 Site review and certification of installed components

1.6.2.3.3 Completion of Letters of Commitment and Compliance specified in Section 01 33 50

1.6.2.3.4 Manufacturer’s Engineering Recommendations: Perform composite panel work in accordance with written recommendations from panel manufacturer.

1.6.2.3.5 Verify panel thickness based on maximum deflections provided in this Section and to suit building location and configuration.
1.7 MOCK-UPS

1.7.1 Provide required Mock-Ups in accordance with Section 01 45 00 – Quality Control.

1.7.2 Construct mock-ups for each form of construction, finish, and demonstrating corner and edge conditions, and fastening required to verify selections made under sample submittals and to demonstrate aesthetic effects and qualities of materials and execution before installing panels.

1.7.3 Build mock-ups using exposed and concealed materials indicated for the completed Work, and as follows:

1.7.3.1 Locate mock-ups in the location and of the size indicated or, if not indicated, as directed by Consultant.

1.7.3.2 Notify Consultant 7 days in advance of the dates and times when mock-ups will be constructed.

1.7.3.3 Demonstrate the proposed range of aesthetic effects and workmanship.

1.7.3.4 Obtain Consultant's acceptance of mock-ups before proceeding with construction of panels.

1.7.3.5 Maintain mock-ups during construction in an undisturbed condition as a standard for judging the completed Work.

1.7.3.6 Accepted mock-ups an undisturbed condition at the time of Substantial Performance may form a part of the completed Work.

1.8 DELIVERY, STORAGE, AND HANDLING

1.8.1 Delivery and Acceptance Requirements: Deliver panels and other components so they will not be damaged or deformed; package panels for protection against damage during transportation or handling.

1.8.2 Storage and Handling Requirements: Handling panels with care during unloading, storing, and erection to prevent bending, warping, twisting, and surface damage:

1.8.2.1 Stack materials on platforms or pallets, covered with tarpaulins or other suitable weather tight and ventilated covering

1.8.2.2 Store panels in dry location

1.8.2.3 Do not store panels in contact with other materials that might cause staining, denting, or other surface damage

1.9 SITE CONDITIONS

1.9.1 Site Measurements: Verify locations of structural members and opening dimensions by site measurements before fabrication and indicate measurements on shop drawings for aluminum composite panel assemblies that are indicated to fit other construction; coordinate fabrication schedule with construction progress to avoid delaying the Work.

1.9.2 Established Dimensions: Establish dimensions and proceed with fabricating panel assemblies 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; allow for trimming and fitting.

1.10 WARRANTY

1.10.1 General Warranty: Special warranties specified in this Article shall not deprive the Owner of other rights the Owner may have under other provisions of the Contract Documents and shall be in addition to, and run concurrent with other warranties made by the Contractor under requirements of the Contract Documents.
1.10.2 Special Finish Warranty: Submit a written warranty, signed by manufacturer, covering failure of the factory-applied exterior finish on metal panels within the specified warranty period and agreeing to repair finish or replace panels that show evidence of finish deterioration. Deterioration of finish includes, but is not limited to, colour fade, chalking, cracking, peeling, and loss of film integrity for a period of 20 years from date of Substantial Performance.

2 Products

2.1 MANUFACTURERS

2.1.1 Basis-of-Design Materials: Products named in this Section were used as the basis-of-design for the project; manufacturers listed as additional acceptable materials 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.

2.1.1.1 Basis-of-Design Materials: Alpolic Materials, Mitsubishi Chemical FP America, Inc.

2.1.2 Additional Acceptable Materials Manufacturers: Subject to matching of custom colour and compliance with performance requirements specified in this Section; as established by the Basis-of-Design Materials, use any of the listed manufacturers’ products in accordance with Section 01 62 00 – Product Options; following manufacturer’s do not require submission of a request for substitutions provided required shop drawing and product data submissions are submitted before starting any work of Section:

2.1.2.1 Alucobond, Alcan Composites USA
2.1.2.2 Reynobond, Alcoa Architectural Products

2.1.3 Substitutions: Consultant may consider additional manufacturers having similar products to Acceptable Materials Manufacturers listed above during the construction period, provided they meet the performance requirements established by the named products and provided they submit requests for substitution in accordance with 01 25 00 – Substitution Procedures before starting any work of this Section:

2.1.3.1 Do not use substitute materials to establish Bid Price.
2.1.3.2 Substitutions that appear as a part of the project without review and acceptance by the Consultant will be rejected, and replaced with one of the specified materials.

2.2 PERFORMANCE REQUIREMENTS

2.2.1 System Description: Plans, elevations, details, characteristics, and other requirements indicated are based upon materials and details provided by one manufacturer that forms the Basis-of-Design for products named in this Section and as follows:

2.2.1.1 Responsibility: Delegated Design professional engineer is responsible for designing composite panel assembly, composite panel thickness and connections based on design loads, and verifying that installation meets requirements of the Authority Having Jurisdiction.

2.2.1.2 Provide a rear ventilated rain screen system in accordance with good design practices as established by Canada Mortgage and Housing Corporation for curtain wall assemblies.
2.2.1.3 Provide a system that has no visible fasteners, telegraphing or fastening on the exposed panel faces or other components that detract from a neat and flat finished appearance.
2.2.1.4 Provide a system that does not place restraints on panel that could result in compressive skin stresses, and that will maintain a flat appearance regardless of temperature change.

2.2.2 Design fabricated panel assemblies to meet or exceed the following minimum requirements:

2.2.2.1 Wind Load: Determine wind loads using normal importance factors listed in the Building Code for deflection and strength, modified by the appropriate exposure, gust and pressure (internal and external) factors in accordance with Building Code structural commentaries.

2.2.2.2 Deflection Limitation: Maximum deflection of perimeter not to exceed L/175; whichever is less, under system weight plus wind load (positive and negative) loads acting normal to plane of installation under 1 in 50 year sustained wind loading, and as follows:

2.2.2.2.1 Maximum deflection criteria apply to horizontal plane of system, width and length, as well as vertical deflection.

2.2.2.2.2 Include adequate stiffeners and fasteners are included to prevent excessive deflection.

2.2.2.3 Thermal Movement: Design system that allows for thermal movements without buckling, opening of joints, overstressing of components, failure of joint sealants, failure of connections, and other detrimental effects resulting from the following maximum change in ambient and surface temperatures:

2.2.2.3.1 Base design calculation on surface temperatures of materials due to both solar heat gain and night time sky heat loss.

2.2.2.3.2 Temperature Range:
- Ambient Conditions: 65°C
- Surface Conditions: 100°C

2.2.2.3.3 Operating Range: -32°C to +55°C

2.2.2.4 Building Movement: Include provisions to accommodate movement in composite panel system and between composite panel system and building structure where these movements are caused by deflection of building structure.

2.2.2.5 Drainage: Provide for positive drainage to the exterior of all water entering or condensation occurring within the system in accordance with NRC Rain Screen Principles.

2.3 ALUMINUM COMPOSITE PANEL MATERIALS

2.3.1 Composite Panel: Aluminum: Two sheets of custom finished AA3000 or AA5000 Series aluminum sandwiching a fire rated composite core, formed in a continuous process with no glues or adhesives between dissimilar materials, and as follows:

2.3.1.1 Total Composite Thickness: 4 mm
2.3.1.2 Core: Non-combustible in accordance with ASTM D1929, CAN/ULC S102, CAN/ULC S114, and CAN/ULC S134
2.3.1.3 Face Sheets: Nominal 0.50 mm thick
2.3.1.4 Finish: Finish system consisting of 3 Coat Fluoro Ethylene–Alkyl Vinyl Ether (FEVE) Coating, finished using heat cured coating system composed of specially formulated inhibitive primer, fluoropolymer colour coat, and clear alkyl ether resin; coil coated with FEVE resin in accordance with ASTM D3363, ASTM E84, and ASTM D968 coating thicknesses as follows:

2.3.1.4.1 Location: MT-1a
2.3.1.4.2 Custom Colour: Metallic – 739L846 (FEVE) Valflon 10725
Metallic 730L002 clear coat

2.3.1.5 Finish (Reflective or Iridescent): Finish system consisting of 3 Coat Fluoro Ethylene–Alkyl Vinyl Ether (FEVE) Coating, finished using heat cured coating system composed of specially formulated inhibitive primer, fluoropolymer colour coat, and clear alkyl ether resin; coil coated with FEVE resin in accordance with ASTM D3363, ASTM E84, and ASTM D968 coating thicknesses as follows:
2.3.1.5.1 Location: MT-1b
2.3.1.5.2 Custom Colour: Prismatic – 739L810 (FEVE) Valflon 10499
Prismatic

2.3.1.6 Finish (Solid): Finish system consisting of 2 Coat PVDF Coating, finished using heat cured coating system composed of specially formulated inhibitive primer, fluoropolymer colour coat, and clear alkyl ether resin; coil coated with Kynar 500 or Hylar 5000 based Polyvinylidene Fluoride (PVDF) resin in accordance with AAMA 2605 coating thicknesses as follows:
2.3.1.6.1 Location: MT-1c
2.3.1.6.2 Colour: Custom colour to match Duranar Bright White – UC55026

2.3.1.7 Finish (Solid): Finish system consisting of 2 Coat PVDF Coating, finished using heat cured coating system composed of specially formulated inhibitive primer, fluoropolymer colour coat, and clear alkyl ether resin; coil coated with Kynar 500 or Hylar 5000 based Polyvinylidene Fluoride (PVDF) resin in accordance with AAMA 2605 coating thicknesses as follows:
2.3.1.7.1 Location: MT-1d
2.3.1.7.2 Colour: Custom colour to match Opaci-Coat 300

2.3.1.8 Finish (Solid): Finish system consisting of 2 Coat PVDF Coating, finished using heat cured coating system composed of specially formulated inhibitive primer, fluoropolymer colour coat, and clear alkyl ether resin; coil coated with Kynar 500 or Hylar 5000 based Polyvinylidene Fluoride (PVDF) resin in accordance with AAMA 2605 coating thicknesses as follows:
2.3.1.8.1 Location: MT-1e
2.3.1.8.2 Colour: Custom colour to match concrete

2.3.1.9 Basis-of-Design Materials: Alpolic /fr

2.3.2 System Back-Up Materials:
2.3.2.1 Girts: Fabricated from minimum 1.27 mm thickness galvanized steel to ASTM A653/A653M, Grade 230 with Z275 coating; finish material visible after assembly of panel to match aluminum panels
2.3.2.2 Sub-Girts: Structural quality steel to ASTM A653/A653M, with Z275 zinc coating to ASTM A792, adjustable double-angle profile as indicated to accept panel with structural attachment to building frame
2.3.2.3 Isolation Tape: Manufacturer’s standard material for separating dissimilar metals from direct contact.

2.3.3 Curtain Wall: As specified in Section 08 44 13
2.3.4 Air and Vapour Membrane: As specified in Section 07 25 13.
2.3.5 Insulation: As specified in Section 07 21 13.13
2.3.6 Insulation Fastenings: Corrosion resistant, galvanized bugle head screws with 38 mm diameter washer, 25 mm minimum penetration into framing.
2.3.7 Accessories: Provide fasteners, gaskets and other materials necessary for a complete installation including the following:

2.3.7.1 Extrusions: Formed aluminum members, sheet, and plate in accordance with ASTM B209 and manufacturers written recommendations and as follows:

- 2.3.7.1.1 Perimeter Extrusions: Alloy: AA-6063-T5 or AA-6063-T6, mill finish where non-exposed; to match panels when exposed.
- 2.3.7.1.2 Stiffeners: Alloy: AA-6063-T5 or AA-6063-T6, mill finish

2.3.7.2 Panel Stiffeners: Structurally fastened or restrained at ends, secured to rear face of composite panel with silicone or double sided high bond isolating tape to prevent weather staining and frost lines to the face of the panel as recommend by panel manufacturer; size stiffeners to maintain panel flatness to specified tolerances; material as recommended by panel manufacturer.

2.3.7.3 Sealants and Gaskets: Panel system components as recommended by panel manufacturer to meet performance requirements.

2.3.7.4 Flashings: Fabricate flashing from 0.75 mm minimum thickness aluminum sheet, coloured to match panel where exposed to view; provide lap strip under flashing at butted conditions, with lapped surfaces sealed in a full bed of non-hardening sealant.

2.3.7.5 Fasteners: Non-corrosive fasteners as recommend by panel manufacturer, and as follows:

- 2.3.7.5.1 Attachment panel system to primary panel structural supports using manufacturer’s recommended concealed fasteners.
- 2.3.7.5.2 Use concealed fasteners for typical joinery.
- 2.3.7.5.3 Obtain Consultant’s acceptance where exposed fasteners are required in isolated conditions; Consultant will permit a limited number of exposed fasteners obscured within panel joinery using stainless steel fastenings, or in the face of panels using colour matched fastenings.

2.4 FABRICATION

2.4.1 Fabricate composite panels and components to obtain profiles and details indicated on drawings and as indicated in shop drawings.

2.4.2 Fabricate components at factory to the greatest extent possible using best shop practices as required by panel manufacturer.

2.4.3 Fabricate components to match quality and installation of reviewed mock-up specified above.

3 Execution

3.1 PREPARATION AND EXAMINATION

3.1.1 Obtain dimensions from project site before fabricating panels.

3.1.2 Verify that building surfaces are smooth, clean and dry, and free from defects detrimental to the installation of the system.

3.1.3 Notify Construction Manager of conditions not acceptable for installation of system, start of work will indicate acceptance of substrate conditions.

3.1.4 Inspect all panels and components prior to installation and verify that there is no shipping damage; do not install damaged panels, repair or replace as required for smooth and consistent finished appearance.

3.2 INSTALLATION

3.2.1 Install air and vapour membrane in accordance with Section 07 25 13.
3.2.2 Install board insulation in accordance with Section 07 21 13.13

3.2.3 Install girts in accordance with manufacturer’s instructions. Provide additional metal framing as may be required to conform to Performance Requirements.

3.2.4 Install girts attached to structural support or framing, using recommended fasteners.

3.2.5 Install insulation between girts forming tight to following applied girt to maintain continuous thermal barrier. Install insulation with disk type fasteners spaced at 305 mm vertical o/c spaced evenly from edges of insulation, and at 406 mm horizontal o/c.

3.2.6 Install fasteners into framing; do not remove fastener where fastener does not penetrate framing; removal of fastener will damage integrity of air/vapour membrane, realign fastener location and install new fastener in close proximity to original fastener so that it penetrates framing.

3.2.7 Install flashings to divert all moisture and condensation to exterior. Trim and flash around doors, louvers, and windows.

3.2.8 Install exterior metal cladding to structural support by hidden mechanical fasteners.

3.2.9 Apply bituminous paint or caulking tape to insulate between the dissimilar materials and aluminum materials. Factory applied protective paint or G-90 galvanized steel is considered adequate insulation.

3.2.10 Install pre-formed corners and end enclosures, sealed to arrest direct weather penetration.

3.2.11 Install panels are aligned vertically and horizontally, and flush between adjacent panels to within tolerances indicated; with weep holes and drainage channels free of dirt and sealants that could impede the function of the rain screen assembly.

3.2.12 Assemble and secure panel system so stresses on sealants are within manufacturers’ recommended limits.

3.2.13 Tolerances:

3.2.13.1 Panel Dimensions: Allow for site adjustment and thermal movement.

3.2.13.2 Panel Fabrication: Fabricate panels under controlled shop conditions to the greatest extent possible; site fabrication will only be permitted where minor adjustments are required to account for substrate variations that could not be identified during the preparation of shop drawings.

3.2.13.3 Panel Lines, Breaks and Curves: Form changes in direction sharp, smooth, and free of warps or buckles.

3.2.13.4 Panel Surfaces: Free of scratches or marks caused during fabrication and installation.

3.2.13.5 Panel Bow: Maximum 0.8% of any 1830 mm panel overall dimension in width or length.

3.2.13.6 Panel Flatness: Maximum 3 mm in 1525 mm deviation from panel flatness non-cumulative; no oil canning.

3.2.13.7 Panel Joints: Maximum 1 mm lippage between any 2 adjacent panels not attached with same fastener; 0 mm lippage where 2 adjacent panels share the same fastener.
3.3 SITE QUALITY CONTROL

3.3.1 Perform final inspection of completed work with manufacturer's representative in attendance; manufacturer's representative shall prepare a written report and submit to Consultant certifying that installation meets manufacturers requirements and detailing for systems described in this Section.

3.3.2 Perform final inspection with Consultant, Construction Manager and Trade Contractor, present; provide a minimum of 72 hours notice so that all parties can confirm their attendance.

3.4 TOUCH-UP AND CLEANING

3.4.1 Remove and replace panels that are damaged and cannot be repaired; coordinate with Construction Manager for responsibility of repairs not caused by work of this Section.

3.4.2 Remove strippable film coating or masking as soon as possible after surrounding material is installed.

3.4.3 Remove excess materials, debris, and equipment at completion.

3.4.4 Clean all panels clean and free of all grime and dirt.

3.4.5 Touch-up damaged finishes with manufacturer’s recommended touch-up paint.

END OF SECTION
1 General

1.1 SUMMARY

1.1.1 This Section includes requirements for the supply and installation of cold applied SBS modified bituminous membrane roofing system consisting of two (2) ply roofing membrane, underlayment board, insulation, vapour barrier adhered to roof board applied to steel roof deck and applied to structural concrete substrates.

1.2 RELATED REQUIREMENTS

1.2.1 Section 03 30 00 – Cast-In-Place Concrete: Coordination for placement of venting strips on concrete roof deck substrates.

1.2.2 Section 05 31 10 – Steel Deck: Coordination of placement of acoustical insulation in steel deck flutes immediately prior to roofing installation [coordination of placement of fully adhered roofing systems where installed over architecturally exposed roof deck].

1.2.3 Section 05 41 00 – Structural Metal Stud Framing: Installation of vapour retarder continuity strips supplied by this section and forming a part of steel framed parapet and curb construction.

1.2.4 Section 06 10 53 – Miscellaneous Rough Carpentry: Materials and finishing requirements for data and voice back boards.

1.2.5 Section 07 05 10 – Common Work Results for Air Barrier and Vapour Retarder Systems: Performance requirements for air barriers and vapour retarders forming a part of the building envelope.

1.2.6 Section 07 08 50 – Membrane Roofing Inspection and Testing

1.2.7 Section 07 25 13 – Modified Bituminous Air and Vapour Membranes: Coordination with wall building envelope system and compatible vapour retarder continuity strip supplied by this Section.

1.2.8 Section 07 62 00 – Sheet Metal Flashing and Trim

1.2.9 Division 22 – Plumbing: Coordination of pipes and pipe fittings and other materials penetrating roof membranes.

1.2.10 Division 23 – Heating, Ventilation and Air Conditioning: Coordination of ductwork and other materials penetrating roof membranes.

1.2.11 Division 26 – Electrical: Coordination conduit, wiring, communications cabling, cable trays and other materials penetrating roof membranes.

1.3 REFERENCE STANDARDS

1.3.1 Roofing Association Publications:

1.3.1.1 Alberta Roofing Contractors Association (ARCA): Manual on Good Roofing Practice and Accepted Roof Systems

1.3.2 American Society for Testing and Materials (ASTM):

1.3.2.1 ASTM C1002-04, Steel Drill Screws for the Application of Gypsum Board

1.3.2.2 ASTM 1177/C1177M-13, Standard Specification for Glass Mat Gypsum Substrate for Use as Sheathing

1.3.2.3 ASTM D4263-83 (2005), Standard Test Method for Indicating Moisture in Concrete by the Plastic Sheet Method
1.3.2.4 ASTM D3273-12 Standard Test Method for Resistance to Growth of Mold on the Surface of Interior Coatings in an Environmental Chamber
1.3.2.5 ASTM E408-71 (2002), Standard Test Methods for Total Normal Emittance of Surfaces Using Inspection-Meter Techniques
1.3.2.6 ASTM E903-96, Standard Test Method for Solar Absorptance, Reflectance, and Transmittance of Materials Using Integrating Spheres

1.3.3 Canadian General Standards Board (CGSB):
1.3.3.1 CGSB 37-GP-56M, Membrane, Modified, Bituminous, Prefabricated and Reinforced for Roofing
1.3.3.2 CGSB 37-GP-64M, Mat Reinforcing, Fibrous Glass, for Membrane Waterproofing Systems and Built-up Roofing
1.3.3.3 CAN/CGSB-37.5-M89, Cutback Asphalt Plastic Cement
1.3.3.4 CAN/CGSB-37.28-M89, Reinforced, Mineral Colloid Type, Emulsified Asphalt for Roof Coatings and Waterproofing
1.3.3.5 CGSB 37-GP-9Ma, Primer, Asphalt, Unfilled, for Asphalt Roofing, Dampproofing or Waterproofing

1.3.4 Canadian Standards Association (CSA):
1.3.4.1 CSA A123.4-04, Bitumen for Use in Construction of Built-up Roof Coverings and Dampproofing and Waterproofing Systems
1.3.4.2 CSA A123.21 (2010), Standard Test Method for the Dynamic Wind Uplift Resistance of Membrane Roofing Systems
1.3.4.3 CSA A231.1-99. (R2003), Precast Concrete Paving Slabs.
1.3.4.4 CSA B111-1974 (R2003), Wires, Nails, Spikes and Staples
1.3.4.5 CSA O121-M1978 (R2003), Douglas Fir Plywood
1.3.4.6 CSA O151-M1978 (R2003), Canadian Softwood Plywood

1.3.5 Factory Mutual Global (FM):
1.3.5.1 Property Loss Prevention Data Sheets:
   1.3.5.1.1 1-28 Design Wind Loads and 1-28R Roof Systems
   1.3.5.1.2 1-29 Roof Deck Securement and Above Deck Roof Components and 1-29R Roof Systems

1.3.6 Underwriters Laboratories Canada (ULC):
1.3.6.1 CAN/ULC S107-03, Standard Methods of Fire Tests of Roof Coverings
1.3.6.2 CAN/ULC S701-05, Thermal Insulation, Polystyrene, Boards and Pipe Covering
1.3.6.3 CAN/ULC S704-03, Standard for Thermal Insulation, Polyurethane and Polysocyanurate, Boards, Faced
1.3.6.4 CAN/ULC S770-2000, Determination of Long-Term Thermal Resistance of Closed-Cell Thermal Insulating Foams

1.4 SUBMITTALS
1.4.1 Provide required information in accordance with Section 01 33 00 – Submittal Procedures.
1.4.2 Action Submittals: Provide the following submittals before starting any work of this Section:
   1.4.2.1 Product Data: Submit copies of membrane manufacturers current technical data sheets describing the physical properties and recommended installation procedures.
   1.4.2.2 Shop Drawings:
      1.4.2.2.1 Submit sloped insulation manufacturer’s proposed roofing diagrams and layouts for review by the Consultant.
1.4.2.2.2 Submit membrane manufacturer’s standard details that will be used for this project, indicate changes that must be made to make the details project specific for review by the Consultant.

1.4.2.2.3 Submit layout of adhesive ribbon pattern.

1.4.3 Informational Submittals: provide the following submittals before starting any work of this Section:

1.4.3.1 Material Compatibility Certificate: Provide roofing system materials that are compatible with building air and vapour retarders specified under Section 07 25 13; submit a written declaration to the Consultant that roofing materials and components are compatible with wall air and vapour retarder membranes when requested by Consultant.

1.4.3.2 Wind Uplift Certificate: Submit written certification prepared by roofing materials manufacturer certifying that roofing system installed meets specified wind uplift performance requirements.

1.4.3.3 A Design Service Life (DSL) of 50 years has been selected for the Grande Prairie Regional Hospital. Submit a letter from the manufacturer confirming that the roofing assembly will have a Predicted Service Life (PSL) of at least half of the life of the building.

1.4.4 Sustainable Design Submittals: Coordinate project sustainable design requirements with Section 01 35 31 - LEED Special Project Procedures and Section 01 35 31A - LEED Material Information Sheet for LEED Submittals; in addition, provide information for following specific requirements of this Section:

1.4.4.1 A Design Service Life (DSL) of 50 years has been selected for the New Central Library. Submit a letter from the manufacturer confirming that the metal panels will have a Predicted Service Life (PSL) of at least half of the life of the building.

1.5 QUALITY ASSURANCE

1.5.1 Obtain roofing membrane materials through one source from a single manufacturer and install using workers who are trained and approved by the roofing membrane manufacturer; maintain a full time experienced journeyman roofer, and at least one apprentice per crew on the Work at all times.

1.5.2 Roofing and sheet metal work will be performed in conformance with the roofing manufacturer’s written recommendations using materials that meet the requirements of CAN/ULC S107 to obtain a Class A fire resistance rating and a Factory Mutual 1-60 Classification; submit proof that roofing materials meet required performance when requested by the Consultant.

1.5.3 Conform to Roofing Application Standards Manual as published by Alberta Roofing Contractors Association Ltd. (ARCA) as a reference as a reference.

1.5.4 Execute work of this section using an applicator approved by the membrane manufacturer and participating in Soprema’s PAQ/S program at time of Bid submission and during execution of Work, and capable of issuing a 15 year Platinum Warranty.

1.6 PRE-CONSTRUCTION MEETING

1.6.1 Arrange a pre-construction meeting in accordance with Section 01 31 19 – Project Meetings to review methods and procedures related to roofing system including; but not limited to, the following:

1.6.1.1 Review structural load limitations of roof deck during and after roofing.

1.6.1.2 Review flashing, special roofing details, roof drainage, roof penetrations, equipment curbs, and condition of other construction that will affect roofing.
1.6.1.3 Review regulations and requirements of Authorities Having Jurisdiction for insurance, certifications, and inspection and testing, if applicable.

1.6.1.4 Review temporary protection requirements for roofing system during and after installation.

1.6.1.5 Introduce Owner's inspection agency and discuss coordination by and responsibilities of roofing inspector, refer to Section 07 08 50.

1.6.1.6 Review of building envelope continuity requirements and coordination with other work on site, refer to Section 07 05 10.

1.6.1.7 Review roof observation and repair procedures after roofing installation.

1.7 DELIVERY, STORAGE AND HANDLING

1.7.1 Deliver materials to the job site; handle and store in original packages and containers with manufacturer's seals and labels intact. The manufacturer's name, brand, mass, specification number and lot number must be shown on the labels.

1.7.2 Store materials in weatherproof shelters having floors that will protect the materials from moisture. Store materials on end. Avoid prolonged exposure of light or heat sensitive materials to sunlight.

1.7.3 Do not store materials on roof in concentrations that exceed design live load.

1.7.4 Place plywood runways over the Work to enable the movement of materials and other traffic during construction of roofing.

1.7.5 Protect surrounding surfaces against damage from roofing work. Where hoisting is necessary, hang tarpaulins to protect walls during delivery of materials from ground to roof.

1.7.6 Materials will be rejected and be replaced at no extra cost to the Owner where materials are damaged by the elements, improper handling or other causes; remove rejected materials promptly from the site.

1.7.7 Protect exposed surfaces of finished walls with tarp to prevent damage during roofing work, repair any damage caused to adjacent materials and finishes caused by roofing installation.

1.8 SITE CONDITIONS

1.8.1 Apply roofing within the range of ambient and substrate temperatures recommended by roofing system manufacturer:

1.8.1.1 Do not apply roofing to a damp or wet substrate.

1.9 WARRANTY

1.9.1 Roofing Membrane Manufacturer: Provide manufacturer's warranty stating that they will repair or replace defective roofing (including labor) and base flashing materials that do not remain watertight, that splits, tears, or separates at the seams or from the substrate within the specified warranty period and as follows:

1.9.1.1 Warranty Period: 15 years, Platinum Warranty, starting from Substantial Performance for the Project.

1.9.1.2 Name of Warrantee: Warrantor shall issue a written and signed warranty identifying the owner's name as the warrantee, and stating that executed work will remain in place and be free of any defects in materials and workmanship for the stated warranty period.
2 Products

2.1 MANUFACTURERS

2.1.1 Basis-of-Design Products: Products named in this Section were used as the basis-of-design for the project; manufacturers listed as additional acceptable materials 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.

2.1.1.1 Basis-of-Design Product: Soprema Inc.

2.1.2 Additional Acceptable Materials Manufacturers: Subject to [matching of colour and] compliance with performance requirements specified in this Section; as established by the Basis-of-Design Materials, use any of the listed manufacturers’ products in accordance with Section 01 62 00 – Product Options; following manufacturer’s do not require submission of a request for substitutions provided required shop drawing and product data submissions are submitted before starting any work of Section:

2.1.2.1 Firestone
2.1.2.2 Siplast

2.1.3 Substitutions: Consultant may consider additional manufacturers having similar products to Acceptable Materials Manufacturers listed above during the construction period, provided they meet the performance requirements established by the named products and provided they submit requests for substitution in accordance with[01 25 00 – Substitution Procedures before starting any work of this Section:

2.1.3.1 Do not use substitute materials to establish Bid Price.

2.2 AUXILIARY LEVELLING SURFACE: ROOF BOARD

2.2.1 Glass Mat Faced Roof Boards: Non-structural, glass mat faced mould resistant gypsum panels having water resistant core, and as follows:

2.2.1.1 Applicable Standard: ASTM C1177/C1177M for manufacturing; ASTM D3273 for mould resistance.
2.2.1.2 Thickness: As indicated
2.2.1.3 Surface Burning Characteristics: In accordance with CAN/ULC S102.
   2.2.1.3.1 Flame Spread: 0
   2.2.1.3.2 Smoke Developed: 0
2.2.1.4 Long Edges: Square.
2.2.1.5 Location: Roof substrates over steel decks and sheathing for parapets.
2.2.1.6 Acceptable Materials:
   2.2.1.6.1 Georgia Pacific DensDeck
   2.2.1.6.2 CertainTeed GlasRoc Sheathing

2.3 FASTENERS

2.3.1 Screw Fasteners: #14 Phillips pre-assembled mechanical fasteners fabricated from case hardened carbon steel with a rust preventive coating; 50 mm diameter, barbed stress plates that meet requirements of CSA B35.3 and FM 4470 approval standard and as follows:

2.3.1.1 Space screws and stress plates one per 0.25 m², penetrating a minimum of 38 mm into top of flutes for corrosion and wind lift factors.
2.3.1.2 Basis-of-Design Materials Soprema SopraFix Fasteners and Plates; as approved by FM for specified system.
2.3.2 Roofing Nails: Spiral nails having 25 mm Ø steel round top cap 25 mm Ø and 3 mm Ø shank in accordance with membrane manufacturer’s recommendations, length to penetrate solid wood supports by a minimum of 38 mm and plywood substrates by a minimum of 19 mm.

2.4 ADHESIVES

2.4.1 Primer for Self Adhered Membranes: Primer comprised of elastomeric bitumen and solvents, and adhesive enhancing resins as recommended by membrane roofing manufacturer to suit substrates and installation conditions.

2.4.2 Membrane Roofing Adhesive: High performance SBS modified adhesive specifically formulated for installation of membrane roofing system, and as follows:

2.4.2.1 Basis-of-Design Materials: Sopralene Stick

2.4.3 Membrane Flashing Adhesive: High performance SBS modified adhesive specifically formulated for installation of membrane roofing system, and as follows:

2.4.3.1 Basis-of-Design Materials: Sopralene Stick Adhesive

2.4.4 Insulation and Gypsum Board Adhesive: Manufacturers elastomeric, two component foaming adhesive system specifically formulated for installation of roofing materials, and as follows:

2.4.4.1 Basis-of-Design Materials: Soprema Duotack Adhesive

2.5 VAPOUR RETARDER

2.5.1 Pre-manufactured Self Adhesive Air/Vapour Barrier: Self-adhesive air/vapour barrier membranes composed of bitumen modified with thermoplastic polymers and high density polyethylene film; 1140 mm width to allow membrane to span top flute of structural steel deck, and having water vapour permeance of 0.92 ng/Pa•s•m², and as follows:

2.5.1.1 Acceptable material:

2.5.1.1.1 Bakor Vapor-Bloc SA
2.5.1.1.2 Soprema Sopravap'R

2.5.2 Vapour Retarder Continuity Strip: Self-adhesive SBS membrane with non-woven polyester reinforcement, glass grid and elastomeric bitumen; having sanded upper surface; underside self-adhesive compatible with wall and roof air/vapour retarder membranes as recommended by membrane manufacturer.

2.6 INSULATION

2.6.1 Primary Flat Insulation: Polyisocyanurate closed cell foam rigid board roof insulation core laminated to heavy non-asphaltic glass fibre reinforced facers specifically formulated for use with cold applied roofing membranes; 25 mm thickness of largest panels practical, having square edges, minimum LTTR RSI 1.04/25 mm; conforming to ULC S704, Type 3, Class 2, to a tolerance not exceeding 3 mm from nominal size in any dimension, and as follows:

2.6.1.1 Acceptable Materials:

2.6.1.1.1 Atlas AC Foam III, by Atlas
2.6.1.1.2 E’NRGY’ 3, by Johns Manville
2.6.1.1.3 COLGRIP B by Soprema
2.6.2 Secondary Flat and Sloped Insulation: Moulded expanded polystyrene (MEPS) rigid board roof insulation consisting of largest panels practical, having square edges, minimum LTTR RSI 0.73/25 mm, total thickness as indicated on Drawings, sloped to a minimum 2% perpendicular from edge of roof to a minimum thickness of [25 mm] [50 mm]; conforming to ULC S701, Type II, to a tolerance not exceeding 3 mm from nominal size in any dimension:

2.6.2.1 Acceptable materials:
   2.6.2.1.1 Beaver Plastics, Beaverfoam
   2.6.2.1.2 Plasti-Fab, Plastispan

2.7 COVER BOARD (UNDERLAYMENT)

2.7.1 Glass mat faced gypsum board, moisture and mould resistant, having a non-combustible core, primed ready for cold adhesive application of SBS base sheets and as follows:

2.7.1.1 Acceptable Materials:
   2.7.1.1.1 Georgia Pacific, DensDeck Prime
   2.7.1.1.2 Firestone, Coverdeck 250

2.8 ROOF MEMBRANE SYSTEM

2.8.1 Roof Membranes: Roof waterproofing system comprised of reinforced, elastomeric bitumen base sheet and cap sheet applied using manufacturer’s recommended cold adhesive; base sheet having two surfaces sanded; cap sheet having bottom surface sanded and top surface is protected by coloured granules and having a ULC Class A Rating, and as follows:

2.8.1.1 Applicable Standard: CAN/CGSB 37-GP-56M
2.8.1.2 Reinforcement: Combination of Glass and Polyester
2.8.1.3 Bitumen: Elastomeric blend of bitumen and SBS Polymer
2.8.1.4 Protection: Coloured Granules – Light Grey

2.8.1.5 System Properties:

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2.8.1.6 Basis-of-Design Materials:
   2.8.1.6.1 Base Sheet: Soprema Sopralene Stick Adhesive
   2.8.1.6.2 Cap Sheet: Soprema Soprastar Stick HD FR GR

2.8.2 Flashing, Stripping and Up-stand Membranes: Two ply reinforced modified bitumen membrane base sheet and cap sheet; base sheet having self-adhering bottom surface and sanded top surface; cap sheet having bottom surface sanded and top surface is protected by coloured granules and having a ULC Class A Rating, and as follows:

2.8.2.1 Applicable Standard: CAN/CGSB 37-GP-56M
2.8.2.2 Reinforcement: Combination of Glass and Polyester
2.8.2.3 Bitumen: Elastomeric blend of bitumen and SBS Polymer
2.8.2.4 Protection: Coloured Granules – Light Grey
2.8.2.5 System Properties:
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2.8.2.6  Basis-of-Design Materials:
2.8.2.6.1  Base Sheet: Soprema SopraFlash Stick
2.8.2.6.2  Cap Sheet: Soprema Soprastar Stick HD FR GR

2.8.3  Roofing Membrane Reinforcement: Manufacturer’s recommended composite heavy duty SBS modified bitumen membrane forming a part of a complete roofing assembly and to suit site conditions.

2.9  PIPE SUPPORTS
2.9.1  Pre-manufactured Pipe Supports: Pre-manufactured pipe supports fabricated from 100% recycled rubber eligible for contribution towards project LEED requirements for recycled materials, with 2.7 mm thickness galvanized steel frame, 150 mm wide x 100 mm tall x length to suit installation; including fasteners, bridge components, and angled supports as required for a complete installation and having the following accessories:
2.9.1.1  Pipe and Conduit Support: Galvanized pipe clamp sized to suit gas pipe in accordance with manufacturers instructions.
2.9.1.2  Multi-Pipe and Conduit Support: Galvanized pipe support system size and number to suit pipes being supported in accordance with manufacturer’s instructions.
2.9.1.3  Extendable Height Support: Galvanized steel pipe extensions to suit installation in accordance with manufacturer’s instructions.
2.9.1.4  Basis-of-Design Materials: Clearline Technologies, C-Port

2.10  ACCESSORIES
2.10.1  Concrete Pavers: High density hydraulic pressed pavers, nominal 610 mm x 760 mm weight not exceeding 45 kg per unit, field area and border in different colours, colours selected by Consultant from standard range, white cement to achieve minimum Solar Reflective Index (SRI), and as indicated on drawings.
2.10.1.1  Basis-of-Design Materials: Expocrete Pavers
2.10.2  Pedestals: High density polyethylene formed into a 8 X 8 grid like structure with integral spacer ribs on upper surface and shims for proper level alignment.
2.10.3  Waterproofing Mastic: Mastic comprised of synthetic rubbers, plasticized with bitumen and solvents, and aluminium pigments to provide greater resistance to ultraviolet light degradation.
2.10.4  Pitch Pocket Filler: Aluminium coloured solvent based mastic containing bitumen modified with SBS synthetic rubber and fibres, specifically intended for pitch pocket fill.
3 Execution

3.1 EXAMINATION

3.1.1 Verify that substrates and conditions are in accordance with manufacturer’s written recommendations and installation guidelines before starting work of this Section.

3.1.2 Start of roofing work will be interpreted as meaning roofing conditions are in accordance with manufacturer’s requirements.

3.2 PREPARATION

3.2.1 Protect finished work to avoid damage during roof installation and material transportation.

3.2.2 Install protective boardwalks to enable passage of personnel and materials without causing damage to installed roofing materials.

3.2.3 Mount mechanical application devices on pneumatic tired wheels; use devices designed and maintained to operate without damaging insulation, roofing membrane or structural components.

3.2.4 Do not place flame heated equipment on roof; provide and maintain a fire extinguisher adjacent to flame heated equipment at ground level in close proximity to heated equipment.

3.2.5 Open flame torches and application equipment will not be permitted on the roof; use only electrically heated equipment where installation of roofing components requires heated equipment.

3.3 INSTALLATION

3.3.1 Prepare surfaces and complete roofing work specified in this Section in accordance with manufacturer’s written instructions and guidelines.

3.3.2 Install roofing elements on clean and dry surfaces; in a continuous operation when substrates are ready and as weather conditions permit.

3.3.3 Seal seams in base sheets that are not covered by a cap sheet membrane in the same day; do not install cap sheet if any moisture is present at or within base sheet seams.

3.3.4 Protect work of other sections during installation of work of this Section; repair or compensate other sections for damage caused by this Section.

3.4 ROOF BOARD INSTALLATION

3.4.1 Fasten roof board to upper flute surfaces of steel deck in accordance with requirements of Factory Mutual, Bulletin 1-28 for installation of boards to roof perimeters and corners for 1-60 installation requirements; cut boards so that edges rest on centre of upper flutes using straight lines and sharp tools.

3.4.2 Cut boards neatly where slopes change directions; do not break boards to conform to deck slopes; place boards perpendicular to deck flutes for continuous support at extremities.

3.5 PRIMER INSTALLATION

3.5.1 Apply primer to roof board roofing substrates at a rate recommended by roofing membrane system manufacturer.

3.5.2 Verify that surfaces being primed are free of rust, dust or any residue that reduces adhesion.

3.5.3 Cover primed surfaces with roofing membrane within time limits recommended by roofing membrane system manufacturer.
3.6 AIR/VAPOUR BARRIER INSTALLATION

3.6.1 Install self-adhering air/vapour barrier membrane by unrolling air/vapour barrier membrane onto substrate aligned with substrate materials starting at bottom of slope without removing silicone release sheet, and as follows:

3.6.1.1 Align roll parallel to steel deck flutes supporting membrane overlaps on top of flute along entire length.

3.6.1.2 Peel back one end of silicone release sheet and adhere membrane to substrate; peel remaining release sheet at a 45° angle to avoid wrinkles in membrane.

3.6.1.3 Cut roll and start again where membrane is not properly aligned to deck flutes; re-align membrane and overlap end of misaligned piece by 150 mm.

3.6.1.4 Overlap adjacent membranes by 75 mm; overlap end laps by 150 mm; stagger end laps by 300 mm; place thin sheet of metal under end lap of membrane to provide structural support to lapped membranes.

3.6.2 Overlap roof air/vapour barrier to wall air/vapour barrier using compatible continuity strip to provide continuity of building envelope.

3.6.3 Install air/vapour barrier at insulation perimeters and around each element piercing insulation to provide sealed connections with base sheet at up-stands.

3.7 INSULATION INSTALLATION

3.7.1 Adhere insulation to air/vapour barrier using manufacturer’s recommended adhesive applied at rate recommended by manufacturer; adhere insulation at locations where roof deck will be visible in final installation.

3.7.2 Mechanically attach insulation fastening into top flutes of steel deck in accordance with manufacturer’s written recommendations, and Factory Mutual requirements for [1-60 wind uplift criteria]; do not mechanically attach insulation where roof deck will be visible in final installation.

3.7.3 Install secondary insulation layer onto air/vapour barrier as the first layer, followed by installation of manufacturer’s required primary flat insulation ready for installation of cold adhesive applied membrane roofing.

3.7.4 Stagger vertical joints between primary insulation boards and secondary insulation modules and between two rows of insulation board.

3.7.5 Install only as much insulation as can be covered by roof membranes in the same day.

3.8 COVER BOARD (UNDERLAYMENT) INSTALLATION

3.8.1 Install underlayment in accordance with manufacturer’s written requirements, and as follows:

3.8.1.1 Firmly set the insulation overlay boards, long joints continuous and short joints staggered. Boards must be evenly and tightly butted together, with joints offset from primary insulation joints.

3.8.1.2 Apply only as many boards as can be covered by roofing membrane in the same day.

3.8.1.3 Cut out a 10 mm slope in a 600 mm radius around drains.

3.9 COLD ADHESIVE APPLIED BASE SHEET INSTALLATION

3.9.1 Install membrane base sheet in full bed of adhesive applied at rate recommended by roofing membrane manufacturer using a notched 5 mm neoprene squeegee starting at drain and perpendicular to slope.

3.9.2 Apply base sheet in parallel strips, lapping side joints 100 mm and end joints 150 mm; stagger end joints a minimum of 300 mm.
3.9.3 Roll surface installed membrane using a 30 kg steel roller to smooth membrane and to provide continuous and uniform adhesion to insulation.

3.9.4 Seal lap joints of base sheet at end each workday; perform work without interruption to avoid tears and formation of fish mouths, air pockets or wrinkles.

3.9.5 Cut off corners at end laps being covered by next roll.

3.9.6 Terminate base sheet at top of cant or at perimeter.

3.10 REINFORCEMENT GUSSET INSTALLATION

3.10.1 Install gussets at every angle, and on inside and outside corners.

3.10.2 Install self-adhesive gussets before installing self-adhesive base sheet flashing membranes.

3.11 BASE SHEET FLASHING INSTALLATION

3.11.1 Apply base sheet flashing when primer coat is dry and in accordance with manufacturer’s written instructions.

3.11.2 Position pre-cut membrane pieces; peel back 100 mm to 150 mm of silicone release paper to hold the membrane in place at the top of the parapet, then gradually peel back remaining silicone release paper, pressing down on the membrane with aluminium applicator to provide good adhesion and to provide smooth transition between up-stand and field surface; smooth entire membrane surface with a roller for full adhesion.

3.11.3 Cut off corners at end laps being covered by next roll.

3.11.4 Install a reinforcing gusset in all inside and outside corners.

3.11.5 Seal overlaps at the end of each workday.

3.12 COLD ADHESIVE CAP SHEET INSTALLATION

3.12.1 Install cap sheet in a full bed of adhesive applied at a rate recommended by membrane manufacturer using notched 5 mm neoprene squeegee starting at drains and perpendicular to the slope; use brush grade or trowel grade adhesive as required for different membrane installation requirements as recommended by manufacturer’s written installation requirements.

3.12.2 Lap side joints 100 mm and end joints 150 mm; stagger end joints and joints between membranes plies a minimum of 300 mm; stagger base and cap sheet membranes by 300mm.

3.12.3 Brush surface to provide complete and uniform adhesion immediately after placement of membrane into adhesive.

3.12.4 Cut off corners at end laps being covered by next roll.

3.12.5 Provide a smooth application, free of wrinkles, fish mouths, air pockets or tears.

3.12.6 Terminate cap sheet at top of cant or at perimeter.

3.13 CAP SHEET FLASHING INSTALLATION

3.13.1 Install cap sheet in 1000 mm wide strips with side joints overlapped by 100 mm and staggered 100 mm with respect to joints of cap sheet within field surface to avoid areas of excessive membrane thickness, and as follows:

3.13.1.1 Overlaps on field surface must be 50 mm wider than those of base sheet membrane on up-stands and parapets.

3.13.1.2 Angle cut the corners that will be covered by the following roll at end laps.

3.13.2 Use a chalk line to draw a straight line on the field surface 150 mm from the up-stands and parapets.
3.13.3 Adhere cap sheet to base sheet membrane starting from bottom and working to top using trowel grade adhesive applied with 5 mm notched steel trowel at a rate recommended by membrane manufacturer; use roller to apply even pressure over entire surface to provide uniform adhesion across entire surface.

3.13.4 Walkway Installation:

3.13.4.1 Walkway Cap Sheet Strips (Traffic Course): Install roofing membrane walkway cap sheet strips (contrasting colour, colour confirmed by Consultant) over roofing membrane by torch application.

3.13.4.2 Locations as indicated on Drawings

3.14 WATERPROOFING AT ROOF DRAINS

3.14.1 Coordinate with Division 22 for installation of roof drains and sumps.

3.14.2 Adhere 1000 mm x 1000 mm reinforcement band using membrane type as recommended by manufacturer in a diagonal position to base sheet and previously primed drain flange.

3.14.3 Apply pressure at drain connectors to provide a complete seal.

3.14.4 Install cap sheet to edge of opening.

3.14.5 Fasten dome to drain.

3.15 ROOF PAVER INSTALLATION

3.15.1 Install concrete roof pavers where indicated in accordance with manufacturer's written instructions using pedestals.

3.16 SITE QUALITY CONTROL

3.16.1 Inspection and testing of roofing application will be carried out by testing laboratory designated by Owner in cooperation with the Consultant.

3.16.2 Inspection fees will be paid by the Owner in accordance with Section 01 45 00 – Quality Control.

END OF SECTION
1 General

1.1 SUMMARY

1.1.1 This Section includes sheet metal flashing and trim in the following categories:

1.1.1.1 Roof drainage systems
1.1.1.2 Exposed trim
1.1.1.3 Copings
1.1.1.4 Metal flashing

1.1.2 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.

1.1.3 Membrane through wall and roof flashings are identified in affected related sections and specified in Section 07 25 13.

1.2 RELATED REQUIREMENTS

1.2.1 Section 06 10 53 – Miscellaneous Rough Carpentry: Blocking for support of flashings and copings.

1.2.2 Section 07 25 13 – Modified Bituminous Air and Vapour Retarders: Through wall membrane flashings and roof transition membrane flashings

1.2.3 Section 07 42 43 – Composite Panels: Flashing and accessories installed integral with wall system work.

1.2.4 Section 07 52 23 – Cold Adhesive Applied Bituminous Membrane Roofing: Flashing and roofing accessories installed integral with roofing membrane as part of roofing system work.

1.2.5 Section 07 72 33 – Roof Hatches

1.2.6 Section 07 92 00 – Joint Sealants: Elastomeric sealants.

1.2.7 Section 08 11 13 – Steel Doors and Frames

1.2.8 Section 08 44 13 – Glazed Aluminum Curtain Walls

1.2.9 Section 08 63 00 – Metal Framed Skylights

1.3 REFERENCE STANDARDS

1.3.1 Aluminum Association (AA):

1.3.1.1 Designation System for Aluminum Finishes, 1997
1.3.1.2 Guidelines for Aluminum Sheet Metal Work in Building Construction, 2000

1.3.2 American Society for Testing and Materials (ASTM):

1.3.2.1 ASTM B209-04, Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate
1.3.2.2 ASTM A653/A653M-11, Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process
1.3.2.3 ASTM A755/A755M-03, Standard Specification for Steel Sheet, Metallic Coated by the Hot-Dip Process and Prepainted by the Coil-Coating Process for Exterior Exposed Building Products
1.3.2.4 ASTM B32-03, Specification for Solder Metal

1.3.3 Canadian Standards Association (CSA):
1.3.3.1 CSA A123.3-98 (R2004), Asphalt or Tar Saturated Roofing Felt

1.3.4 Canadian General Standards Board (CGSB):
1.3.4.1 CAN/CGSB 37.5-M89, Cutback Asphalt Plastic Cement
1.3.4.2 CAN/CGSB 37.29-M89, Rubber/Asphalt Sealing Compound
1.3.4.3 CAN/CGSB 51.32-M77, Sheathing, Membrane, Breather Type

1.3.5 Other References:
1.3.5.1 The Alberta Roofing Contractors Association (ARCA): Manual on Good Roofing Practice and Accepted Roofing Systems

1.4 ADMINISTRATIVE REQUIREMENTS

1.4.1 Coordination:
1.4.1.1 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.

1.5 SUBMITTALS

1.5.1 Provide required information in accordance with Section 01 33 00 – Submittal Procedures.

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

1.5.2.1 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.
1.5.2.2 Samples: Submit samples of sheet metal flashing, trim, and accessory items, in the specified finish, as follows:

1.5.2.2.1 Include 2 or more units showing the full range of variations expected, where finish involves normal colour and texture variations,
1.5.2.2.2 Include 300 mm square Samples of specified sheet materials indicating exposed finished surfaces.
1.5.2.2.3 Include 300 mm long samples of factory fabricated products exposed as finished work with specified factory finish.
1.5.1 Sustainable Design Submittals: Coordinate project sustainable design requirements with Section 01 35 31 - LEED Special Project Procedures and Section 01 35 31A - LEED Material Information Sheet for LEED Submittals.

1.6 QUALITY ASSURANCE

1.6.1 Qualifications: Provide proof of qualifications when requested by Consultant:

1.6.1.1 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.

1.7 MOCK-UPS

1.7.1 Provide required Sample Installation in accordance with Section 01 45 00 – Quality Control.

1.7.2 Construct mock-ups to verify selections made under sample submittals and to demonstrate aesthetic effects as well as qualities of materials and execution before installing sheet metal flashing and trim.

1.7.3 Build mock-ups in accordance with the following requirements, using materials indicated for final unit of work:

1.7.3.1 Locate mock-ups in the location and of the size indicated or, if not indicated, as directed by Consultant.

1.7.3.2 Notify Consultant seven (7) days in advance of the dates and times when mock-ups will be constructed.

1.7.3.3 Demonstrate the proposed range of aesthetic effects and workmanship.

1.7.3.4 Construct mock-ups for the following type of sheet metal flashing and trim:

1.7.3.4.1 Gutters and downspouts.
1.7.3.4.2 Conductor heads.
1.7.3.4.3 Scuppers.
1.7.3.4.4 Exposed trim, gravel stops, and fasciae.
1.7.3.4.5 Copings.

1.7.3.5 Obtain Consultant's acceptance of mock-ups before proceeding with construction.

1.7.3.6 Maintain mock-ups during construction in an undisturbed condition as a standard for judging the completed Work.

1.7.3.7 Acceptable mock-ups in an undisturbed condition at the time of Substantial Performance may become part of the completed Work.

1.7.4 Consultant will review mock-up and may request minor changes to enhance performance or aesthetic appearance, and as follows:

1.7.4.1 Unaccepted mock-ups shall be removed, repaired, or rebuilt as required to meet project requirements.

1.7.4.2 Installer will be entitled to claim for increased costs where changes requested by Consultant require an additional cost to the system.

1.7.4.3 Costs will not be reimbursable and changes will be made to meet indicated details before acceptance by Consultant where increased costs arise from not following Consultant's design drawings.
2 Products

2.1 MANUFACTURERS

2.1.1 Acceptable Materials Manufacturers: Subject to compliance with requirements specified in this Section; where multiple listings of manufacturers occur, use any of the following listed manufacturers’ products in accordance with Section 01 62 00 – Product Options including the following:

2.1.2 Substitutions: Consultant may consider additional manufacturers having similar products to Acceptable Materials Manufacturers listed above during the construction period, provided they meet the performance requirements established by the named products and provided they submit requests for substitution in accordance with Section 01 25 00 – Substitution Procedures before starting any work of this Section:

2.1.2.1 Do not use substitute materials to establish Bid Price.
2.1.2.2 Substitutions that appear as a part of the project without review and acceptance by the Consultant will be rejected, and replaced with one of the specified materials.

2.2 METAL FLASHING MATERIALS

2.2.1 Zinc Galvanized Sheet Steel Flashing: Tension levelled, Commercial Steel (CS) designation, Type A, Grade 230 in accordance with ASTM A653/A653M and as follows:

2.2.1.1 Thickness: Minimum 0.45 mm base metal thickness, and as modified by Article 2.5 below.
2.2.1.2 Galvanizing Designation: Z275 applied evenly to both sides.
2.2.1.3 Metal Flashing:

2.2.1.3.1 Surface Texture: Smooth
2.2.1.3.2 Finish: Prefinished colour selected from manufacturer’s extended range using Silicone Modified Polyester Valspar WeatherXL or Baycoat Barrier 10000.

2.2.2 Formed Aluminum Flashings: Tension levelled, aluminum sheet in accordance with ASTM B209 and ANSI H35.1 alloy designation 3003-H14 and as follows:

2.2.2.1 Thickness: Minimum 1.00 mm, and as modified by Item 2.5 below.
2.2.2.2 Aluminum Flashing: Prefinished colour selected from manufacturer’s extended range using Duranar XL.

2.3 MISCELLANEOUS MATERIALS AND ACCESSORIES

2.3.1 Solder: ASTM B32, Grade Sn50, used with rosin flux for galvanized steel flashings.

2.3.2 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.

2.3.3 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
2.3.4 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.

2.3.5 Mastic Sealant: CAN/CGSB 37.29 polyisobutylene; non-hardening, non-skinning, non-drying, non-migrating sealant.

2.3.6 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.

2.3.7 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.

2.3.8 Adhesives: Type recommended by flashing sheet metal manufacturer for waterproof and weather resistant seaming and adhesive application of flashing sheet metal.

2.3.9 Slip Sheet: CSA A123.3, No. 15 perforated asphalt saturated felts.

2.3.10 Flexible Flashing: Polyethylene faced bituminous membrane materials compatible with membrane air and vapour retarder specified in Section 07 25 13, 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.

2.3.11 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.

2.3.12 Roofing Cement: CAN/CGSB 37.5, asbestos free, asphalt based.

2.4 FABRICATION, GENERAL

2.4.1 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.

2.4.2 Fabricate sheet metal roofing flashings in accordance with the recommendations of the ARCA, and as follows:

   2.4.2.1 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.

   2.4.2.2 Make flashing for other roof locations, of plain galvanized metal.

2.4.3 Fabricate flashings using the following metal core thicknesses for indicated assemblies:

   2.4.3.1 Flat Surfaces Less Than 300 mm in Width or Height: Use 0.45 mm material except where specifically noted otherwise.

   2.4.3.2 Flat Surfaces 300 mm and Greater in Width or Height: Use 0.62 mm material except where specifically noted otherwise.

   2.4.3.3 Concealed Fastening Strips: Use 0.80 mm material.

2.4.4 Fabricate sheet metal flashing and trim to fit substrates and result in waterproof and weather resistant performance once installed.
2.4.5 Verify shapes and dimensions of surfaces being covered before fabricating sheet metal.

2.4.6 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.

2.4.7 Seams:
   2.4.7.1 Fabricate non-moving seams in sheet metal with flat lock seams.
   2.4.7.2 Tin edges being seamed, form seams, and solder.

2.4.8 Expansion Provisions:
   2.4.8.1 Space movement joints at 3050 mm O/C with no joints allowed within 610 mm of corners or intersections
   2.4.8.2 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.

2.4.9 Sealed Joints: Form non-expansion, but movable, joints in metal to accommodate elastomeric sealant in accordance with SMACNA standards.

2.4.10 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.

2.4.11 Conceal fasteners and expansion provisions where possible. Exposed fasteners are not allowed on faces of sheet metal exposed to public view.

2.4.12 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:
   2.4.12.1 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

2.5.1 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.
2.5.2 Downspouts: Fabricate from the following material:
   2.5.2.1 Aluminum: 0.6 mm thick.
   2.5.2.2 Stainless Steel: 0.40 mm thick.
   2.5.2.3 Galvanized Steel: 0.55 mm thick.
   2.5.2.4 Aluminum Zinc Alloy Coated Steel: 0.55 mm thick.
   2.5.2.5 Coil Coated Galvanized Steel: 0.55 mm thick.

2.5.3 Conductor Heads: Fabricate from the following material:
   2.5.3.1 Aluminum: 0.80 mm thick.
   2.5.3.2 Stainless Steel: 0.40 mm thick.
   2.5.3.3 Galvanized Steel: 0.70 mm thick.
   2.5.3.4 Aluminum Zinc Alloy Coated Steel: 0.70 mm thick.
   2.5.3.5 Coil Coated Galvanized Steel: 0.70 mm thick.

2.5.4 Splash Pans: Fabricate from the following material:
   2.5.4.1 Aluminum: 1.00 mm thick.
   2.5.4.2 Stainless Steel: 0.50 mm thick.

2.5.5 Roof Drain Flashing: Fabricate from the following material:
   2.5.5.1 Stainless Steel: 0.40 mm thick.

2.5.6 Scuppers: Fabricate from the following material:
   2.5.6.1 Aluminum: 0.80 mm thick.
   2.5.6.2 Stainless Steel: 0.50 mm thick.
   2.5.6.3 Galvanized Steel: 0.70 mm thick.
   2.5.6.4 Aluminum Zinc Alloy Coated Steel: 0.70 mm thick.
   2.5.6.5 Coil Coated Galvanized Steel: 0.70 mm thick.

2.5.7 Built-in Gutters: Fabricate from the following material:
   2.5.7.1 Stainless Steel: 0.40 mm thick.

2.5.8 Exposed Trim, Gravel Stops, and Fasciae: Fabricate from the following material:
   2.5.8.1 Aluminum: 1.20 mm thick.
   2.5.8.2 Stainless Steel: 0.50 mm thick.
   2.5.8.3 Galvanized Steel: 0.70 mm thick.
   2.5.8.4 Aluminum Zinc Alloy Coated Steel: 0.70 mm thick.
   2.5.8.5 Coil Coated Galvanized Steel: 0.70 mm thick.

2.5.9 Copings: Fabricate from the following material:
   2.5.9.1 Aluminum: 1.20 mm thick.
   2.5.9.2 Stainless Steel: 0.65 mm thick.
   2.5.9.3 Coil Coated Galvanized Steel: 1.0 mm thick.

2.5.10 Base Flashing: Fabricate from the following material:
   2.5.10.1 Aluminum: 1.00 mm thick.
   2.5.10.2 Stainless Steel: 0.50 mm thick.
   2.5.10.3 Galvanized Steel: 0.70 mm thick.
   2.5.10.4 Coil Coated Galvanized Steel: 0.70 mm thick.
2.5.11 Counter Flashing: Fabricate from the following material:

2.5.11.1 Aluminum: 0.80 mm thick.
2.5.11.2 Stainless Steel: 0.50 mm thick.
2.5.11.3 Galvanized Steel: 0.55 mm thick.
2.5.11.4 Coil Coated Galvanized Steel: 0.55 mm thick.

2.5.12 Flashing Receivers: Fabricate from the following material:

2.5.12.1 Aluminum: 0.80 mm thick.
2.5.12.2 Stainless Steel: 0.40 mm thick.
2.5.12.3 Galvanized Steel: 0.55 mm thick.
2.5.12.4 Aluminum Zinc Alloy Coated Steel: 0.55 mm thick.
2.5.12.5 Coil Coated Galvanized Steel: 0.55 mm thick.

2.5.13 Valley Flashing: Fabricate from the following material:

2.5.13.1 Stainless Steel: 0.50 mm thick.
2.5.13.2 Coil Coated Galvanized Steel: 0.70 mm thick.

2.5.14 Drip Edges: Fabricate from the following material:

2.5.14.1 Aluminum: 0.80 mm thick.
2.5.14.2 Stainless Steel: 0.40 mm thick.
2.5.14.3 Galvanized Steel: 0.55 mm thick.
2.5.14.4 Aluminum Zinc Alloy Coated Steel: 0.55 mm thick.
2.5.14.5 Coil Coated Galvanized Steel: 0.55 mm thick.

2.5.15 Eave Flashing: Fabricate from the following material:

2.5.15.1 Aluminum: 0.80 mm thick.
2.5.15.2 Stainless Steel: 0.40 mm thick.
2.5.15.3 Galvanized Steel: 0.55 mm thick.
2.5.15.4 Aluminum Zinc Alloy Coated Steel: 0.55 mm thick.
2.5.15.5 Coil Coated Galvanized Steel: 0.55 mm thick.

2.5.16 Equipment Support Flashing: Fabricate from the following material:

2.5.16.1 Stainless Steel: 0.50 mm thick.
2.5.16.2 Galvanized Steel: 0.70 mm thick.
2.5.16.3 Coil Coated Galvanized Steel: 0.70 mm thick.

2.5.17 Roof Penetration Flashing: Fabricate from the following material:

2.5.17.1 Stainless Steel: 0.50 mm thick.
2.5.17.2 Galvanized Steel: 0.70 mm thick.
2.5.17.3 Aluminum Zinc Alloy Coated Steel: 0.70 mm thick.

2.6 ALUMINUM EXTRUSION FABRICATIONS

2.6.1 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

3.1.1 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

3.2.1 Install sheet metal flashing and trim in accordance with performance requirements, manufacturer's installation instructions, and SMACNA's Architectural Sheet Metal Manual.

3.2.2 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.

3.2.3 Install Work with laps, joints, and seams that will be permanently watertight and weatherproof.

3.2.4 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.

3.2.5 Verify shapes and dimensions of surfaces being covered before fabricating sheet metal.

3.2.6 Roof Edge Flashings: Secure metal flashings at roof edges at a maximum of 610 mm O/C and in accordance with FM Loss Prevention Data Sheet 1-49 for specified wind zone.

3.2.7 Expansion Provisions:

3.2.7.1 Provide for thermal expansion of exposed sheet metal Work.
3.2.7.2 Space movement joints at maximum of 3050 mm with no joints allowed within 610 mm of corner or intersection.
3.2.7.3 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.

3.2.8 Soldered Joints:

3.2.8.1 Clean surfaces being soldered, removing oils and foreign matter.
3.2.8.2 Pre-tin edges of sheets being soldered to a width of 38 mm, except where pre-tinned surface would show in finished Work.
3.2.8.3 Do not solder the following metals:

3.2.8.3.1 Aluminum.
3.2.8.3.2 Coil coated galvanized steel sheet.

3.2.8.4 Pre-tinning is not required for the following metals:

3.2.8.4.1 Lead.
3.2.8.4.2 Lead coated copper.
3.2.8.4.3 Terne coated stainless steel.
3.2.8.5 Do not use torches for soldering.
3.2.8.6 Heat surfaces to receive solder and flow solder into joint.
3.2.8.7 Fill joint completely.
3.2.8.8 Completely remove flux and spatter from exposed surfaces.

3.2.9 Sealed Joints:
3.2.9.1 Form non-expansion, but movable, joints in metal to accommodate elastomeric sealant in accordance with SMACNA standards.
3.2.9.2 Fill joint with sealant and form metal to completely conceal sealant.
3.2.9.3 Use joint adhesive for non-moving joints specified not being soldered.

3.2.10 Seams:
3.2.10.1 Fabricate non-moving seams in sheet metal with flat lock seams.
3.2.10.2 Tin edges being seamed, form seams, and solder.

3.2.11 Seams: Fabricate non-moving seams in aluminum with flat lock seams. Form seams and seal with epoxy seam sealer. Rivet joints for additional strength.

3.2.12 Separations:
3.2.12.1 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.
3.2.12.2 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.
3.2.12.3 Bed flanges of Work in a thick coat of roofing cement where required for waterproof performance.

3.2.13 Counter Flashings:
3.2.13.1 Coordinate installation of counter flashings with installation of assemblies being protected by counter flashing. Install counter flashings in reglets or receivers.
3.2.13.2 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.
3.2.13.3 Lap counter flashing joints a minimum of 50 mm and bed with sealant.

3.2.14 Roof Drainage System:
3.2.14.1 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.
3.2.14.2 Coordinate roof drain flashing installation with roof drainage system installation.
3.2.14.3 Coordinate flashing and sheet metal items for steep sloped roofs with roofing installation.

3.2.15 Overhead Piping Safety Pans: Suspend pans from pipe and install drain line to plumbing waste or drain line.

3.2.16 Equipment Support Flashing:
3.2.16.1 Coordinate equipment support flashing installation with roofing and equipment installation.
3.2.16.2 Weld or seal flashing to equipment support member.

3.2.17 Roof Penetration Flashing:

3.2.17.1 Coordinate roof penetration flashing installation with roofing and installation of items penetrating roof.

3.2.17.2 Turn lead flashing down inside vent piping, being careful not to block vent piping with flashing.

3.2.17.3 Seal and clamp flashing to pipes penetrating roof, other than lead flashing on vent piping.

3.2.18 Splash Pans:

3.2.18.1 Install where downspouts discharge on low sloped roofs.

3.2.18.2 Set in roof cement or sealant compatible with roofing membrane.

3.2.19 Install continuous gutter screens on gutters with non-corrosive fasteners, arranged as hinged units to swing open for cleaning gutters.

3.3 CLEANING AND PROTECTION

3.3.1 Clean exposed metal surfaces, removing substances that might cause corrosion of metal or deterioration of finishes.

3.3.2 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
1.1.1 This Section includes requirements for supply and installation of roof hatches and system accessories required for complete and operational smoke vent installation.

1.2 RELATED REQUIREMENTS
1.2.1 Section 01 35 31 - LEED Special Project Procedures
1.2.2 Section 05 12 00 – Structural Steel Framing: Roof opening framing supporting smoke vents, coordinated with roof framing requirements.
1.2.3 Section 07 52 23 - Cold Adhesive Applied Modified Bituminous Membrane Roofing
1.2.4 Section 07 92 00 – Joint Sealers
1.2.5 Section 09 91 00 – Painting: Site painting of factory primed steel units.

1.3 ADMINISTRATIVE REQUIREMENTS
1.3.1 Coordination: Coordinate installation of roof hatches with roofing installation for membrane laps and flashings; coordinate with structural framing for roof structure and requirements for size of roof opening and support of pre-manufactured curbs.

1.4 SUBMITTALS
1.4.1 Provide required information in accordance with Section 01 33 00 – Submittal Procedures.
1.4.2 Action Submittals: Provide following submittals before starting any work of this Section:
   1.4.2.1 Product Data: Submit product data for roof hatches including construction, hardware and finishes.
   1.4.2.2 Shop Drawings: Submit shop drawings indicating size and description of components, materials, attachment, description of frame and finish, and construction details.
1.4.3 Sustainable Design Submittals: Coordinate project sustainable design requirements with Section 01 35 31 - LEED Special Project Procedures and Section 01 35 31A - LEED Material Information Sheet for LEED Submittals.

1.5 PROJECT CLOSEOUT SUBMISSIONS
1.5.1 Provide operations and maintenance information in accordance with [Section 01 78 23 – Operations and Maintenance Data for smoke vents with pertinent details, spare parts lists and warnings against harmful maintenance materials and practices.

2 Products

2.1 MANUFACTURERS
2.1.1 Acceptable Materials Manufacturers: Subject to compliance with requirements specified in this Section; where multiple listings of manufacturers occur, use any of the following listed manufacturers’ products in accordance with Section 01 62 00 – Product Options including the following:
   2.1.1.1 Babcock-Davis
   2.1.1.2 Bilco Company
   2.1.1.3 Lexcan Ltd.
   2.1.1.4 Maxam Metal Products Ltd.
   2.1.1.5 Nystrom Inc.
2.1.2 Substitutions: Consultant may consider additional manufacturers having similar products to Acceptable Materials Manufacturers listed above during the construction period, provided they meet the performance requirements established by the named products and provided they submit requests for substitution in accordance with Section 01 25 00 – Substitution Procedures before starting any work of this Section:

2.1.2.1 Do not use substitute materials to establish Bid Price.
2.1.2.2 Substitutions that appear as a part of the project without review and acceptance by the Consultant will be rejected, and replaced with one of the specified materials.

2.2 DESIGN REQUIREMENTS

2.2.1 Design roof hatches to withstand 1.9 kPa external and 0.95 kPa internal loads accounting for regional snow load requirements and a temperature range of 80°C without damage to unit or permanent deformation to seals.

2.3 MANUFACTURED UNITS

2.3.1 Roof Hatches: Provide roof hatches with insulated double wall lids and insulated double wall curb frame with integral deck mounting flange and lid frame counter flashing with welded sealed corner joints, continuous weather tight perimeter gasketing and hot dip galvanized hardware, and as follows:

2.3.1.1 Type: Single Leaf Lid as indicated on Drawings
2.3.1.2 Curb and Lid Material: Galvanized steel sheet, nominal 2.0 mm minimum thickness
2.3.1.3 Insulation: Polyisocyanurate insulation board, minimum 50 mm thickness
2.3.1.4 Interior Lid Liner: Manufacturer’s standard metal liner of same material and finish as outer metal lid
2.3.1.5 Exterior Curb Liner: Manufacturer’s standard metal liner of same material and finish as metal curb
2.3.1.6 Hardware: Galvanized steel, counterbalanced spring latch with turn handles, butt or pintle type hinge system as standard for manufacturer, and padlock hasps inside and outside
2.3.1.7 Latching: Single point, using manufacturer’s standard latching mechanism having hold open operating arm with vinyl grip handle to permit one handed release

2.3.2 Fabricate curbs to maintain a minimum height of 300 mm above top of roofing membrane; provide tapered curb to maintain level lid where slope is greater than 2% - 20 mm in 1000 mm.

2.4 ACCESSORIES

2.4.1 Screws: Manufacturer’s standard galvanized steel for mounting curb to structure.
2.4.2 Gaskets: Resilient gasket to inner face of lid in contact with hatch lid support frame.
2.4.3 Ladder Safety Post: Manufacturer’s standard nominal 40 mm Ø galvanized steel tube ladder safety post; with post locking in place on full extension to 1070 mm above roof surface and release mechanism to return post to closed position, finished with manufacturer’s standard baked enamel finish.
2.4.4 Safety Railing System: Manufacturer's standard safety rail system consisting of
nominal 40 mm Ø rails, clamps, fasteners, safety barrier at railing opening, and
all accessories required for a complete installation installed so that top of railing
is 1070 mm above roof surface, finished with manufacturer’s standard baked
enamel finish, and as follows:

2.4.4.1 Provide weep holes or another means to drain entrapped water in
hollow sections of handrail and railing members that are exposed to
exterior or to moisture from condensation or other sources.

2.4.4.2 Fabricate joints exposed to weather in a watertight manner.

2.4.4.3 Close exposed ends of handrail and railing members with
prefabricated end fittings.

2.5 FINISHES

2.5.1 Galvanized Steel Finishes: Prime painted ready for site finishing, refer to
Section 09 91 00.

2.6 FABRICATION

2.6.1 Fabricate components free of twists, bends, or visual distortion and insulated;
with flashings designed to collect and lead off accumulated condensation.

3 Execution

3.1 EXAMINATION

3.1.1 Verification of Conditions: Examine areas and conditions under which work of
this Section is being performed and identify conditions detrimental to proper or
timely completion:

3.1.1.1 Verify that deck, curbs, roof membrane, base flashing, and other items
affecting Work of this Section are in place and positioned correctly.

3.1.1.2 Verify tolerances and correct improper conditions.

3.1.1.3 Starting of work indicates acceptance of conditions

3.2 INSTALLATION

3.2.1 Install roof hatches watertight and fully operational in accordance with
manufacturer's instructions in accordance with manufacturer's instructions and as
follows:

3.2.1.1 Erect components plumb, level and in proper alignment.

3.2.1.2 Verify continuity of building envelope air barrier and vapour retarder
systems.

3.2.1.3 Adjust and seal assembly with provision for expansion and contraction
of components.

3.2.1.4 Secure prefabricated curb assembly to structure.

3.3 PROJECT CLOSEOUT ACTIVITIES

3.3.1 Adjusting: Adjust hardware for smooth operation; clean and lubricate operating
joints and hardware.

3.3.2 Cleaning: Clean exposed surfaces in accordance with manufacturer's written
instructions; touch up damaged metal coatings

END OF SECTION
1 General

1.1 SUMMARY

1.1.1 This Section includes requirements for design, supply and installation of fireproofing, having a fire resistance rating as indicated on Drawings applied to underside of supporting structural steel framing and joists including; but not limited to, work required to patch, repair and make good after installation of adjacent materials that may cause damage to completed work of this Section.

1.1.2 Structural steel elements that are protected by masonry, concrete, or a rated gypsum board assembly do not require protection using materials specified in this Section provided that protection provided meets required fire resistance as determined from Chapter 2 of Supplement to Building Code.

1.2 RELATED REQUIREMENTS

1.2.1 Section 03 30 00 Cast-In-Place Concrete: Protection of concrete structures susceptible to fire damage.

1.2.2 Section 05 05 19 – Common Work Results for Metalwork Finishing: Coordination of surface preparation and priming requirements for structural steel surfaces.

1.2.3 Section 05 12 00 – Structural Steel Framing: Substrate preparation for structural steel framing requiring fire rating.

1.2.4 Section 05 21 00 – Steel Joist Framing: Substrate preparation for structural steel joist framing requiring fire rating.

1.2.5 Section 05 31 00 – Steel Decking Substrate preparation for steel decking requiring fire rating.

1.2.6 Section 07 05 53 – Fire and Smoke Assembly Design Requirements and Identification: Coordination of fire rating systems, and design and submittal requirements.

1.2.7 Section 07 84 00 – Firestopping

1.3 REFERENCE STANDARDS

1.3.1 American Society for Testing of Materials (ASTM):

1.3.1.1 ASTM E119-12a, Standard Test Methods for Fire Tests of Building Construction and Materials

1.3.1.2 ASTM E605-93 (2011), Tests for Thickness and Density of Sprayed Fire-Resistive Material Applied to Structural Members

1.3.1.3 ASTM E736-00 (2011), Standard Test Method for Cohesion/Adhesion of Sprayed Fire-Resistive Materials Applied to Structural Members

1.3.1.4 ASTM E759-92 (2011), Standard Test Method for Effect of Deflection on Sprayed Fire-Resistive Material Applied to Structural Members

1.3.1.5 ASTM E761-92 (2011), Standard Test Method for Compressive Strength of Sprayed Fire-Resistive Material Applied to Structural Members

1.3.1.6 ASTM E859-93 (2011), Standard Test Method for Air Erosion of Sprayed Fire-Resistive Materials (SFRMs) Applied to Structural Members

1.3.2 Underwriters Laboratories of Canada (ULC):

1.3.2.1 CAN/ULC S101-07, Fire Endurance Tests of Building Construction and Materials

1.3.2.2 CAN/ULC S102-10 Surface Burning Characteristics of Building Materials and Assemblies

1.3.2.3 ULC List of Equipment and Materials
1.3.3 National Fire Protection Association (NFPA):
   1.3.3.1 NFPA 251-06, Standard Methods of Fire Tests of Building Construction and Materials

1.4 ADMINISTRATIVE REQUIREMENTS

1.4.1 Coordination: Coordinate with Section 05 05 19 so that steel surfaces meet manufacturer’s minimum surface preparation requirements for bond surface, free from wax, grease or other deleterious material that could affect bond of materials specified in this Section, and as follows:
   1.4.1.1 Coordinate installation of hangers, inserts, clips and similar items to surfaces needing protection before applying mineral fibre fireproofing.
   1.4.1.2 Coordinate installation of ducts, pipes, conduits and similar items that could obstruct spraying operations before applying mineral fibre fireproofing.
   1.4.1.3 Coordinate patching of mineral fibre fireproofing after installation of materials installed subsequent to installation of mineral fibre fireproofing.

1.4.2 Delegated Design: Provide engineered judgements and certification for work performed by this Section in accordance with requirements of Authority Having Jurisdiction and Section 01 33 50 – Delegated Design Submittals.

1.5 SUBMITTALS

1.5.1 Provide required information in accordance with Section 01 33 00 – Submittal Procedures.

1.5.2 Action Submittals: Provide the following submittals before starting any work of this Section:
   1.5.2.1 Product Data: Submit product data including certified copies of test reports verifying fire resistant material applied to substrate as constructed on project will meet or exceed requirements of specification.
   1.5.2.2 Installation Schedule: Submit schedule listing surfaces to which fire resistant material is applied, indicating minimum thickness required a minimum of one month prior to scheduled application of cementitious fireproofing material.

1.5.3 Informational Submittals: Provide the following submittals when requested by the Consultant:
   1.5.3.1 Certificates: Submit test results in accordance with CAN/ULC S101 for fire endurance and CAN/ULC S102 for surface burning characteristics.
   1.5.3.2 Delegated Design Submittals: Design intumescent coating thickness required by the Contract Documents to withstand fire ratings indicated and in accordance with requirements of the Building Code, and as follows:
      1.5.3.2.1 Provide manufacturers standard listing where site conditions match standard assembly listings.
      1.5.3.2.2 Provide manufacturers engineered judgment, indicating acceptance by the authorities having jurisdiction, signed and sealed by manufacturer’s design engineer, where assembly does not match standard assembly listing.

1.5.4 Sustainable Design Submittals: Coordinate project sustainable design requirements with Section 01 35 31 - LEED Special Project Procedures and Section 01 35 31A - LEED Material Information Sheet for LEED Submittals.
1.6 QUALITY ASSURANCE

1.6.1 Regulatory Requirements: Use materials and methods required to achieve fire resistance ratings required for the Project to the satisfaction of the Authority Having Jurisdiction, Alberta Building Code and in accordance with referenced standards.

1.6.2 Qualifications: Provide proof of qualifications when requested by Consultant:

1.6.2.1 Applicator: Use applicators that are licensed or approved by manufacturer of fire resistant material.

1.6.2.2 Materials: Use materials produced under label service of an agency that has tested material, or assemblies containing material, in accordance with specified test standards.

1.6.2.3 Air Quality: Provide ventilation in areas receiving fire resistant material during and 24 hours after application to dry material; maintain non-toxic, unpolluted working area; provide temporary enclosure to prevent spray from contaminating air.

1.6.3 Certifications: Provide the following during the course of the Work:

1.6.3.1 Compliance Certification: Provide certificates from manufacturer indicating tested performance requirements required by Authorities Having Jurisdiction.

1.6.3.2 Letters of Commitment and Compliance: Provide documents prepared by the delegated design professional engineer as recommended by APEGAs Responsibilities for Engineering Services for Building Projects in accordance with Section 01 33 50 – Delegated Design Submittals.

1.7 DELIVERY, STORAGE AND HANDLING

1.7.1 Delivery and Acceptance Requirements: Deliver in original undamaged sealed containers with manufacturer's labels, application instructions, and labelling agency's labels intact.

1.7.2 Storage and Handling Requirements: Store materials in dry protected area, raised off ground and away from damp surfaces and conditions that have deleterious effect on materials; keep materials dry until ready for use; discard material that has been exposed to water before actual use; use stock before its expiration date.

1.8 SITE CONDITIONS

1.8.1 Ambient Conditions: Apply fireproofing materials when temperature of substrate and surrounding air is above manufacturer’s minimum temperature, provide sufficient ventilation to aid curing of materials and to maintain air quality requirements.

2 Products

2.1 MANUFACTURERS

2.1.1 Acceptable Materials Manufacturers: Subject to compliance with requirements specified in this Section; where multiple listings of manufacturers occur, use any of the following listed manufacturers’ products in accordance with Section 01 62 00 – Product Options including the following:

2.1.1.1 Carboline Company, A/D Fire Protection Systems Inc.
2.1.1.2 Grace Construction Products
2.1.1.3 Isolatek International Inc., Cafco Industries Limited
2.1.2 Substitutions: Consultant may consider additional manufacturers having similar products to Acceptable Materials Manufacturers listed above during the construction period, provided they meet the performance requirements established by the named products and provided they submit requests for substitution in accordance with Section 01 25 00 – Substitution Procedures before starting any work of this Section:

2.1.2.1 Do not use substitute materials to establish Bid Price.
2.1.2.2 Substitutions that appear as a part of the project without review and acceptance by the Consultant will be rejected, and replaced with one of the specified materials.

2.2 APPLIED FIREPROOFING

2.2.1 Design Criteria:

2.2.1.1 Adhesion: Provide materials that meet or exceed adhesion requirements in accordance with ASTM E736.

2.2.1.2 Thickness and Weight: Determine application thickness and weight of mineral fibre fireproofing based on tests of assemblies in accordance with CAN/ULC S101, ASTM E119 or NFPA 251; apply same thickness of fireproofing material to all structural components forming a part of the assembly including; but not limited to, cross bracing, support angles and hangers.

2.2.1.3 Engineered Judgements: Provide engineered judgement acceptable to Authority Having Jurisdiction where assembly being protected differs from the tested assembly used to determine thickness.

2.2.2 Vermiculite-Cement Based Fire Resistant Material: Wet mix spray applied cement based fireproofing meeting requirements of ASTM E736, ASTM E759, ASTM E761 and ASTM E859; containing no asbestos fibre, ULC labelled and listed for assemblies and fire ratings indicated on Drawings, and as follows:

2.2.2.1 Acceptable Materials:

2.2.2.1.1 Carboline, A/D Southwest Fireproofing Type 7 GP
2.2.2.1.2 Isolake, Cafco 400
2.2.2.1.3 Grace, Monokote Z-106HY

2.2.3 Water: Clean, fresh, suitable for domestic consumption, and free from such amounts of mineral or organic substance as would affect set of fire resistant material.

2.2.4 Primer/Adhesive: Manufacturers recommended primer and adhesive enhancing bonding material forming a part of fire resistant system for coated or hard to bond to substrates.

2.2.5 Accessories: Reinforcement mesh, wire lath, and other components necessary for a complete and functioning fireproof coating installation.

3 Execution

3.1 EXAMINATION

3.1.1 Verification of Conditions: Verify that environmental conditions surfaces receiving mineral fibre fireproofing meet manufacturer’s requirements before beginning installation products specified in this Section; installation of products will denote acceptance of site conditions.
3.2 PREPARATION

3.2.1 Protection of Existing Conditions:

3.2.1.1 Provide and maintain temporary enclosures to prevent spray from marring adjacent construction, close off and seal installed duct work to prevent contamination of air supply system.

3.2.1.2 Provide and maintain masking, drop cloths and polyethylene coverings to protect surfaces exposed in final construction from over spray.

3.2.2 Surface Preparation:

3.2.2.1 Clean surfaces receiving sprayed fireproofing of oil, grease, dirt, loose paint, mill scale or any other material that could impair bond.

3.2.2.2 Prime surfaces as required by manufacturer to achieve bond of fireproofing materials to substrates.

3.3 APPLICATION

3.3.1 Apply mineral fibre fireproofing in accordance with manufacturer’s written installation requirements and as required to obtain fire resistance ratings indicated for the Project.

3.3.2 Apply mineral fibre fireproofing in coats not exceeding recommended by manufacturer for fire resistance ratings indicated for the Project.

3.3.3 Mix each batch of material separately in accordance with manufacturer’s instructions to achieve required density and thickness; do not re-temper material or use frozen, caked, or lumpy material.

3.3.4 Cut, patch, and repair material that does not meet requirements of this Section or which fails to attain properties stipulated in reports of tests used to determine fire resistance rating of assembly.

3.3.5 Repair damage to fire resistant material caused by installation of subsequent Work.

3.4 SITE QUALITY CONTROL

3.4.1 Site Testing and Inspections: Site testing and inspections will be performed in accordance with requirements specified in Section 01 45 00 – Quality Control and as follows:

3.4.1.1 Owner may appoint third party inspection and testing agency to confirm that installation of mineral fibre fireproofing meets requirements of ASTM E605 and ASTM E736.

3.4.1.2 One series of tests will be performed using both laboratory and site testing for each 1000 m² of floor area sprayed; patch and repair inspection locations after completion of cut tests.

3.4.1.3 Test results will be distributed to Construction Manager and installing Trade Contractor at completion of each floor by Consultant.

3.4.2 Non-Conforming Work: Repair deficiencies identified in test results; patch damage to mineral fibre fireproofing caused by other work of the Project before mineral fibre fireproofing is concealed; or if exposed, before substantial performance.

3.5 CLOSEOUT ACTIVITIES

3.5.1 Cleaning: Remove equipment and clean exposed wall and floor areas to remove deposits of sprayed mineral fibre fireproofing materials after completion of mineral fibre fireproofing work.

END OF SECTION
1 General

1.1 SUMMARY

1.1.1 This Section includes joint sealants for the following applications, including those specified by reference to this Section:

1.1.1.1 Exterior joints for vertical surfaces and horizontal non-traffic surfaces:

1.1.1.1.1 Construction joints in cast-in-place concrete.
1.1.1.1.2 Joints between plant precast architectural concrete units.
1.1.1.1.3 Control and expansion joints in unit masonry.
1.1.1.1.4 Joints in exterior insulation and finish systems.
1.1.1.1.5 Joints between metal panels.
1.1.1.1.6 Joints between different materials listed above.
1.1.1.1.7 Perimeter joints between materials listed above and frames of doors, windows, and louvers.
1.1.1.1.8 Control and expansion joints in ceilings and other overhead surfaces.
1.1.1.1.9 Other joints as indicated.

1.1.1.2 Exterior joints for horizontal traffic surfaces:

1.1.1.2.1 Isolation and contraction joints in cast-in-place concrete slabs.
1.1.1.2.2 Joints between plant precast architectural concrete paving units.
1.1.1.2.3 Joints in stone paving units, including steps.
1.1.1.2.4 Tile control and expansion joints.
1.1.1.2.5 Joints between different materials listed above.
1.1.1.2.6 Other joints as indicated.

1.1.1.3 Interior joints in the following vertical surfaces and horizontal non-traffic surfaces:

1.1.1.3.1 Control and expansion joints on exposed interior surfaces of exterior walls.
1.1.1.3.2 Perimeter joints of exterior openings where indicated.
1.1.1.3.3 Tile control and expansion joints.
1.1.1.3.4 Vertical joints on exposed surfaces of unit masonry and concrete walls and partitions.
1.1.1.3.5 Perimeter joints between interior wall surfaces and frames of interior doors, windows and elevator entrances.
1.1.1.3.6 Joints between walls and millwork, and walls and backsplashes
1.1.1.3.7 Joints between plumbing fixtures and adjoining walls, floors, and counters.
1.1.1.3.8 Other joints as indicated.

1.1.1.4 Interior joints in the following horizontal traffic surfaces:

1.1.1.4.1 Isolation joints in cast-in-place concrete slabs.
1.1.1.4.2 Control and expansion joints in stone flooring.
1.1.1.4.3 Control and expansion joints in tile flooring.
1.1.1.4.4 Other joints as indicated.

1.2 RELATED REQUIREMENTS

1.2.1 Other sections of the specification requiring sealants refer to this section; coordinate requirements of referencing sections.
1.3 REFERENCE STANDARDS

1.3.1 American Society for Testing and Materials (ASTM):

1.3.1.1 ASTM C834-10, Standard Specification for Latex Sealants
1.3.1.2 ASTM C919-08, Standard Practice for Use of Sealants in Acoustical Applications
1.3.1.3 ASTM C920-11, Standard Specification for Elastomeric Joint Sealants
1.3.1.4 ASTM C1184-05, Standard Specification for Structural Silicone Sealants
1.3.1.5 ASTM C1193-11, Standard Guide for Use of Joint Sealants
1.3.1.6 ASTM C1248-08, Standard Test Method for Staining of Porous Substrate by Joint Sealants
1.3.1.7 ASTM C1311-10, Standard Specification for Solvent Release Sealants
1.3.1.8 ASTM C1330-02, Standard Specification for Cylindrical Sealant Backing for Use with Cold Liquid Applied Sealants
1.3.1.10 ASTM D2240-05, Standard Test Method for Rubber Property - Durometer Hardness

1.3.2 Canadian General Standards Board (CGSB):

1.3.2.1 CGSB 19-GP-5M, Sealing Compound, Single component, Acrylic Base, Solvent Curing
1.3.2.2 CGSB 19-GP-14M, Sealing Compound, Single component, Butyl-Polysobutylene Polymer Base, Solvent Curing
1.3.2.3 CAN/CGSB 19.17-M90, Single component, Acrylic Emulsion Base Sealing Compound
1.3.2.4 CAN/CGSB 19.13-M87, Sealing Compound, Single component, Elastomeric, Chemical Curing
1.3.2.5 CAN/CGSB 19.24-M90, Multicomponent, Chemical Curing, Sealing Compound

1.3.3 Sealant, Waterproofing and Restoration Institute (SWRI):

1.3.3.1 SWRI Validated Product List

1.4 ADMINISTRATIVE REQUIREMENTS

1.4.1 Pre-Construction Meetings: Arrange a pre-construction meeting in accordance with Section 01 31 19 – Project Meetings with installer, manufacturer’s representative, Construction Manager and Consultant present, to discuss materials being used on project, compatibility with adjacent materials, and methods of installation.

1.5 SUBMITTALS

1.5.1 Provide required information in accordance with Section 01 33 00 – Submittal Procedures.

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

1.5.2.1 Product Data: Submit product data for each joint sealant product indicated.
1.5.2.2 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.

1.5.3 Informational Submittals: Provide the following submittals when requested by the Consultant:

1.5.4 Sustainable Design Submittals: Coordinate project sustainable design requirements with Section 01 35 31 - LEED Special Project Procedures and Section 01 35 31A - LEED Material Information Sheet for LEED Submittals.

1.6 QUALITY ASSURANCE

1.6.1 Qualifications: Provide proof of qualifications when requested by Consultant:
1.6.1.1 Manufacturer: Obtain each type of joint sealant through one source from a single manufacturer.
1.6.1.2 Installer: Installer shall be experienced with the use and application of materials specified in this Section, have a minimum of five (5) years experience with projects of a similar nature, and be approved or licensed for installation of elastomeric sealants by manufacturer if required for warranty conditions.

1.7 MOCK-UPS

1.7.1 Build mock-ups incorporating sealant joints to verify selections made under sample submittals and to demonstrate aesthetic effects and set quality standards for materials and execution as follows:
1.7.1.1 Joints in mock-ups of assemblies specified in other Sections that are indicated to receive joint sealants, which are specified by reference to this Section.

1.8 PROJECT CONDITIONS

1.8.1 Proceed with installation of joint sealants only when the following conditions are met:
1.8.1.1 Ambient and substrate temperature conditions are within limits permitted by joint sealant manufacturer.
1.8.1.2 Joint substrates are dry.
1.8.1.3 Joint widths are within tolerances of those permitted by joint sealant manufacturer for applications indicated.
1.8.1.4 Substrates are free from contaminants capable of interfering with adhesion.

1.9 WARRANTY

1.9.1 Installer shall provide a warranty stating that they agree to repair or replace joint sealants that do not comply with performance and other requirements specified in this Section for a period of two (2) years from Substantial Performance for the Project.
1.9.2 Manufacturer's shall provide a warranty stating that they agree to provide joint sealants to repair or replace those that do not comply with performance and other requirements specified in this Section for a period of five (5) years from Substantial Performance for the Project.
1.9.3 It is understood that the specified warranties exclude deterioration or failure of joint sealants arising from the following conditions:

1.9.3.1 Movement of the structure resulting in stresses on the sealant exceeding sealant manufacturer's written specifications for sealant elongation and compression caused by structural settlement or errors attributable to design or construction.

1.9.3.2 Disintegration of joint substrates from natural causes exceeding design specifications.

1.9.3.3 Mechanical damage caused by individuals, tools, or other outside agents.

1.9.3.4 Changes in sealant appearance caused by accumulation of dirt or other atmospheric contaminants.

2 Products

2.1 MANUFACTURERS

2.1.1 Acceptable Materials Manufacturers: Subject to compliance with requirements specified in this Section; where multiple listings of manufacturers occur, use any of the following listed manufacturers’ products in accordance with Section 01 62 00 – Product Options including the following:

2.1.1.1 GE Silicones Limited
2.1.1.2 ChemRex Inc., Sonneborn
2.1.1.3 Chemtron Manufacturing Ltd.
2.1.1.4 Dow Corning Canada Inc.
2.1.1.5 Sika Chemical of Canada Ltd.
2.1.1.6 Tremco Ltd.

2.1.2 Substitutions: Consultant may consider additional manufacturers having similar products to Acceptable Materials Manufacturers listed above during the construction period, provided they meet the performance requirements established by the named products and provided they submit requests for substitution in accordance with Section 01 25 00 – Substitution Procedures before starting any work of this Section:

2.1.2.1 Do not use substitute materials to establish Bid Price.
2.1.2.2 Substitutions that appear as a part of the project without review and acceptance by the Consultant will be rejected, and replaced with one of the specified materials.

2.2 MATERIALS

2.2.1 Provide joint sealants, 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, based on testing and site experience.

2.2.2 Colours of exposed joint sealants will be selected by the Consultant from manufacturer’s complete range to match adjacent finish materials.

2.2.3 Elastomeric Joint Sealants: Provide sealants in accordance with ASTM C920 classifications for type, grade, class, and uses related to exposure and joint substrates [and as follows:]

2.2.3.1 Provide products that have been tested in accordance with ASTM C1248 where elastomeric sealants are required for non-staining to porous substrate applications.

2.2.4 Latex Joint Sealants: Provide sealants 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.
2.2.5 Acoustical Sealant for Concealed Joints: Provide sealants in accordance with CAN/CGSB 19.21-M, 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.

2.2.6 Performance Requirements:

2.2.6.1 Provide elastomeric joint sealants for exterior applications that establish and maintain watertight and airtight continuous joint seals without staining or deteriorating joint substrates.

2.2.6.2 Provide joint sealants for interior applications that establish and maintain airtight and water resistant continuous joint seals without staining or deteriorating joint substrates.

2.3 LIQUID SEALANTS

2.3.1 Type S-1 Acrylic Sealant: Single component acrylic latex, Shore A Hardness 20, conforming to CAN/CGSB 19.17-M and ASTM C834:

2.3.1.1 Acceptable Materials:

2.3.1.1.1 Chemtron Latacalk
2.3.1.1.2 Tremco Latex 100
2.3.1.1.3 Sonneborn Sonolac

2.3.2 Type S-2 Silicone Sealant, Mould and Mildew Resistant: Silicone based, Shore A Hardness 15-25, conforming to ASTM C920, Type S, Grade NS, Class 25, use NT, G, and A:

2.3.2.1 Acceptable Materials:

2.3.2.1.1 GE SCS 1700
2.3.2.1.2 Dow Corning 786
2.3.2.1.3 Tremco Tremsil 200
2.3.2.1.4 Sonneborn Omni Plus

2.3.3 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] [Custom Colour to match consultant's sample]:

2.3.3.1 Acceptable Materials:

2.3.3.1.1 GE Silpruf LM SCS 2700
2.3.3.1.2 Dow Corning 791
2.3.3.1.3 Tremco Spectrum 1/Spectrum 3
2.3.3.1.4 Sonneborn Omni Seal

2.3.4 Type S-4 Silicone Sealant, Butt Joint Glazing: Silicone based, single component, moisture curing, 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, Class 25, use NT, G, A, O; Colour: clear (translucent):

2.3.4.1 Acceptable Materials:

2.3.4.1.1 GE SCS2000
2.3.4.1.2 Dow Corning 795
2.3.4.1.3 Chemtron Multiseal
2.3.4.1.4 Tremco Spectrum 2
2.3.5 Type S-5, Interior Acoustical Sealant: Mastic type, non-skinning, non-hardening, single component synthetic rubber sealant, conforming to CAN/CGSB 19.21-M:

2.3.5.1 Acceptable Materials:
   2.3.5.1.1 Chemtron Metaseal
   2.3.5.1.2 Tremco Acoustic Sealant

2.3.6 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:

2.3.6.1 Acceptable Materials:
   2.3.6.1.1 Dow Corning 790
   2.3.6.1.2 GE Silpruf LM or SCS2700
   2.3.6.1.3 Tremco Spectrum 1

2.3.7 Type S-7, Two component Sealant: Chemical curing two component, non-sag, exterior wall sealant, 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:

2.3.7.1 Acceptable Materials:
   2.3.7.1.1 Chemtron Thioplast 400
   2.3.7.1.2 Sikaflex 2c NS
   2.3.7.1.3 Tremco Dymeric
   2.3.7.1.4 Sonneborn NP 2

2.3.8 Type S-8, Horizontal Joint Sealant: Two component, self levelling, conforming to CAN/CGSB 19.24M, Type 1, Class A, and ASTM C920, Type M, Grade P, Class 5, use T, M, and O:

2.3.8.1 Acceptable Materials:
   2.3.8.1.1 Sikaflex 2c SL
   2.3.8.1.2 Tremco THC-901
   2.3.8.1.3 Sonneborn SL 2

2.3.9 Type S-9, Fuel Resistant Sealant: Two component, polyurethane elastomeric, chemical cured, conforming to ASTM C 920, Type M, Grade P, Class 25:

2.3.9.1 Acceptable Materials:
   2.3.9.1.1 Sikaflex-2c NS/SL
   2.3.9.1.2 Sonneborn Sonomic 2
   2.3.9.1.3 Dow Corning 888
   2.3.9.1.4 Mameco/Vulkem 202

2.3.10 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:

2.3.10.1 Acceptable Materials:
   2.3.10.1.1Chemtron Multiflex
   2.3.10.1.2Sikaflex 1-a
   2.3.10.1.3Sika/Sternson RC-1
   2.3.10.1.4Tremco Dymonic
   2.3.10.1.5Sonneborn NP 1
   2.3.10.1.6Mameco/Vulkem 116
2.3.11 Type S-11, Saw Cut Sealant: Two component, self levelling, conforming to ASTM D2240:

2.3.11.1 Acceptable Materials:

2.3.11.1.1 BASF Masterfill 300i
2.3.11.1.2 Cappar EF
2.3.11.1.3 Tremco Control Joint Sealant
2.3.11.1.4 Sonneborn Epolith P
2.3.11.1.5 Sika Loadflex

2.3.12 Type S-12, Control Joint Sealant: Two component, solvent free, flexible epoxy urethane, load bearing, conforming to ASTM D2240, Shore A Hardness 65-75:

2.3.12.1 Basis-of-Design Materials: Sika Loadflex.

2.4 PREFORMED SEALANTS

2.4.1 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:

2.4.1.1 Acceptable Materials:

2.4.1.1.1 Dow Corning Corporation; 123 Silicone Seal
2.4.1.1.2 GE Silicones; UltraSpan US1100
2.4.1.1.3 Tremco; Spectrem Ez Seal

2.5 SEALANT BACKING

2.5.1 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.

2.5.2 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:

2.5.2.1 Use backing rod materials specifically recommended by joint sealer manufacturer for type of installation and materials being used.
2.5.2.2 Use any of the preceding types, as approved in writing by joint sealant manufacturer for joint application indicated.
2.5.2.3 Size and density to control sealant depth and otherwise contribute to producing optimum sealant performance.
2.5.2.4 Non-adhering to sealant, to maintain two sided adhesion across joint.

2.5.3 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

2.6.1 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.

2.6.2 Cleaners for Nonporous Surfaces: Chemical cleaners acceptable to manufacturers of sealants and sealant 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.

2.6.3 Masking Tape: Non-staining, non-absorbent material compatible with joint sealants and surfaces adjacent to joints.
3 Execution

3.1 EXAMINATION

3.1.1 Examine joints indicated to receive joint sealants for compliance with requirements for joint configuration, installation tolerances, and other conditions affecting joint sealant performance.

3.1.2 Proceed with installation after unsatisfactory conditions have been corrected.

3.1.3 Preinstallation Testing: Test and inspect materials of this section in accordance with requirements of Section 01 45 00 – Quality Control, tests will be paid for Trade Contractor as a part of the work for this Section:

3.1.4 Pre-Construction Compatibility and Adhesion Testing: Provide site test reports indicating that joint preparation methods result in optimum adhesion of sealant to joint substrates, as follows:

3.1.4.1 Use manufacturer's standard test method to determine whether priming and other specific joint preparation techniques are required to obtain rapid, optimum adhesion of joint sealants to joint substrates.

3.1.4.2 Test not fewer than eight (8) pieces of each type of material, including joint substrates, shims, joint sealant backings, secondary seals, and miscellaneous materials.

3.1.4.3 Schedule sufficient time for testing and analyzing results to prevent delaying the Work.

3.1.4.4 Obtain joint sealant manufacturer's written instructions for corrective measures including use of specially formulated primers for materials failing tests.

3.1.4.5 Testing will not be required if joint sealant manufacturer submits joint preparation data that are based on previous testing of current sealant products for adhesion to, and compatibility with, joint substrates and other materials matching those submitted.

3.1.5 Pre-Construction Site Adhesion Testing: Site test adhesive adhesion to joint substrates before installing sealants as follows:

3.1.5.1 Locate test joints where indicated on Drawings or, if not indicated, as directed by Consultant.

3.1.5.2 Conduct site tests for each application indicated below:

3.1.5.2.1 Each type of elastomeric sealant and joint substrate indicated.

3.1.5.2.2 Each type of non-elastomeric sealant and joint substrate indicated.

3.1.5.3 Notify Consultant seven (7) days in advance of dates and times when test joints will be installed.

3.1.5.4 Arrange for tests to take place with joint sealant manufacturer's technical representative present in accordance with ASTM C1193, and as follows:

3.1.5.4.1 Test Method: X1.1 Method A, Site Applied Sealant Joint Hand Pull Tab

3.1.5.4.2 Test Method: X1.2 Method B, Exposed Surface Finish Hand Pull Tab

3.1.5.4.3 Test Method: X1.3 Method C, Site Applied Sealant Joint Hand Pull Flap

3.1.5.5 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.
3.1.5.6 Report whether sealant in joint connected to pulled out portion failed to adhere to joint substrates or tore cohesively:
   3.1.5.6.1 Include data on pull distance used to test each type of product and joint substrate.
   3.1.5.6.2 Retest until satisfactory adhesion is obtained for sealants that fail adhesively.

3.1.5.7 Evaluation of Pre-construction Site Adhesion Test Results:
   3.1.5.7.1 Sealants not evidencing adhesive failure from testing, in absence of other indications of non-compliance with requirements, will be considered satisfactory.
   3.1.5.7.2 Do not use sealants that fail to adhere to joint substrates during testing.

3.2 PREPARATION

3.2.1 Clean out joints immediately before installing joint sealants to comply with joint sealant manufacturer's written instructions and the following requirements:
   3.2.1.1 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.
   3.2.1.2 Clean 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.
   3.2.1.3 Remove loose particles remaining after cleaning operations above by vacuuming or blowing out joints with oil free compressed air.
   3.2.1.4 Remove laitance and form release agents from concrete.
   3.2.1.5 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.
   3.2.1.6 Porous joint substrates include the following:
      3.2.1.6.1 Concrete.
      3.2.1.6.2 Masonry.
      3.2.1.6.3 Unglazed surfaces of ceramic tile.
   3.2.1.7 Nonporous joint substrates include the following:
      3.2.1.7.1 Metal.
      3.2.1.7.2 Glass.
      3.2.1.7.3 Porcelain enamel.
      3.2.1.7.4 Glazed surfaces of ceramic tile.
   3.2.2 Prime joint substrates as recommended in writing by joint sealant manufacturer, based on pre-construction joint sealant substrate tests or prior experience:
      3.2.2.1 Apply primer to comply with joint sealant manufacturer's written instructions.
      3.2.2.2 Confine primers to areas of joint sealant bond; do not allow spillage or migration onto adjoining surfaces.
   3.2.3 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.
   3.2.4 Install bond breaker tapes in joints that are too shallow to allow for installation of backing rods.
3.2.5 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

3.3.1 Comply with joint sealant manufacturer's written installation instructions for products and applications indicated, unless more stringent requirements apply.

3.3.2 Comply with recommendations in ASTM C1193 for use of joint sealants as applicable to materials, applications, and conditions indicated.

3.3.3 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.

3.3.4 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.

3.3.4.1 Do not leave gaps between ends of sealant backings.

3.3.4.2 Do not stretch, twist, puncture, or tear sealant backings.

3.3.4.3 Remove absorbent sealant backings that have become wet before sealant application and replace them with dry materials.

3.3.5 Install bond breaker tape behind sealants where sealant backings are not used between sealants and backs of moving joints.

3.3.6 Install sealants at the same time backings are installed, and as follows:

3.3.6.1 Place sealants so they directly contact and fully wet joint substrates.

3.3.6.2 Completely fill recesses in each joint configuration.

3.3.6.3 Produce uniform, cross sectional shapes and depths relative to joint widths that allow optimum sealant movement capability.

3.3.7 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:

3.3.7.1 Remove excess sealant from surfaces adjacent to joints.

3.3.7.2 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 as follows:

3.3.7.2.1 Provide concave joints in accordance with Figure 5A.

3.3.7.2.2 Provide flush joint in accordance with Figure 5B.

3.3.7.2.3 Provide recessed joint configuration in accordance with Figure 5C.

3.3.7.2.4 Use masking tape to protect surfaces adjacent to recessed tooled joints.

3.3.8 Install preformed tapes in accordance with manufacturer's written instructions.

3.3.9 Install preformed silicone sealant system as follows:

3.3.9.1 Apply masking tape to each side of joint, outside of area covered by sealant system.

3.3.9.2 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.
3.3.9.3 Hold edge of sealant bead 6 mm inside masking tape.

3.3.9.4 Press silicone extrusion into sealant to wet extrusion and substrate within 10 minutes of sealant application.

3.3.9.5 Use a roller to apply consistent pressure and ensure uniform contact between sealant and both extrusion and substrate.

3.3.9.6 Complete installation of sealant system in horizontal joints before installing in vertical joints.

3.3.9.7 Lap vertical joints over horizontal joints.

3.3.9.8 Cut silicone extrusion with a razor knife at ends of joints.

3.4 SITE QUALITY CONTROL

3.4.1 Site test joint sealant adhesion to joint substrates as a part of the Contract and as follows:

3.4.1.1 Extent of Testing: Test completed elastomeric sealant joints as follows:

3.4.1.1.1 Perform ten (10) tests for the first 300 metres of joint length for each type of elastomeric sealant and joint substrate.

3.4.1.1.2 Perform one (1) test for each 300 metres of joint length thereafter or one (1) test for each floor and elevation.

3.4.1.2 Test Method: Test joint sealants according to Method A, Site Applied Sealant Joint Hand Pull Tab, Method B, Exposed Surface Finish Hand Pull Tab, Method C, Site Applied Sealant Joint Hand Pull Flap in Appendix X1 in ASTM C 1193, as appropriate for type of joint sealant application indicated.

3.4.1.3 Verify adhesion to each substrate separately for joints having dissimilar substrates; do this by extending cut along one side, verifying adhesion to opposite side, repeat procedure for opposite side.

3.4.1.4 Inspect joints for complete fill, for absence of voids, and for joint configuration complying with specified requirements.

3.4.1.5 Record results in a site adhesion test log, and submit to Owner as a part of Record Document submissions listed in Section 01 78 00.

3.4.1.6 Inspect tested joints and report on the following:

3.4.1.6.1 Whether sealants in joints connected to pulled out portion failed to adhere to joint substrates or tore cohesively:

- Include data on pull distance used to test each type of product and joint substrate.
- Compare these results to determine if adhesion passes sealant manufacturer's site adhesion hand pull test criteria.

3.4.1.6.2 Whether sealants filled joint cavities and are free of voids.

3.4.1.6.3 Whether sealant dimensions and configurations comply with specified requirements.

3.4.1.6.4 Record test results in a site adhesion test log:

- Include dates when sealants were installed, names of persons who installed sealants, test dates, test locations, whether joints were primed, adhesion results and percent elongations, sealant fill, sealant configuration, and sealant dimensions.
- Report any failed tests to the Construction Manager and the Consultant, and indicate repair procedure undertaken to correct failed sealant.

3.4.1.7 Repair sealants pulled from test area by applying new sealants following same procedures used originally to seal joints, ensuring that original sealant surfaces are clean and that new sealant contacts original sealant.
3.4.2 Sealants not evidencing adhesive failure from testing or non-compliance with other indicated requirements will be considered satisfactory:

3.4.2.1 Remove sealants that fail to adhere to joint substrates during testing or to comply with other requirements.

3.4.2.2 Retest failed applications until test results prove sealants comply with indicated requirements.

3.5 CLEANING

3.5.1 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.

3.6 PROTECTION

3.6.1 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.

3.6.2 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.

3.7 JOINT SEALANT SCHEDULE

3.7.1 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.

3.7.2 Use acrylic sealant Type S-1 only on the interior and only in situations where little or no movement can occur.

3.7.3 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.

3.7.4 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.

3.7.5 Use structural glazing silicone Type S-4 for sealing structural glass, exterior.

3.7.6 Use silicone glazing type S-4 for sealing butt glazing joints.

3.7.7 Use structural glazing silicone Type S-4 for sealing smoke baffle structural glazing.

3.7.8 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.

3.7.9 Use air seal sealant Type S-6 for exterior walls only where constant or consistent air pressure difference will exist across the joint.

3.7.10 Use two component sealant Type S-7 for exterior vertical joints where large movement is anticipated; not for continuous water immersion.

3.7.11 Use two component sealant type S-7 for edge joint sealant at slab edges at walls, columns, interior shaft walls and grade beams.

3.7.12 Use two component sealant type S-7, 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.
3.7.13 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.

3.7.14 Use two component polysulphide fuel resistant sealant Type S-9 in pavement around diesel generators, and wherever fuel oils may be present.

3.7.15 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.

3.7.16 Use two component flexible epoxy sealant type S-12 for joint sealant where floor finished "concrete with hardener" and "Ashford Sealer" are specified elsewhere in the Project Manual.

3.7.17 In addition, seal the following joints:

3.7.17.1 Seal perimeters of hollow metal door frames on both sides, and at junction between door frame and resilient or solid flooring materials.
3.7.17.2 Seal perimeters of aluminum door frames on both sides.
3.7.17.3 Seal elevator door frames where they abut concrete or masonry prior to application of finish.
3.7.17.4 Seal control joints in gypsum board, and junctures between interior partitions with exterior walls.
3.7.17.5 Seal control joints in masonry veneer at the outside face.
3.7.17.6 Seal control joints in unit masonry at exterior face.
3.7.17.7 Seal window and door frames around the inside perimeter, so that an airtight seal is obtained, as indicated on drawings.
3.7.17.8 Seal joints at heads of non-load-bearing block walls on both sides, as indicated on drawings.
3.7.17.9 Seal control, expansion joints in floors and walls and around service and fixture penetrations.

END OF SECTION
1 General

1.1 SUMMARY

1.1.1 This Section includes requirements for supply and installation of the following types of electric motor operated overhead coiling doors:

1.1.1.1 Insulated service doors

1.2 RELATED REQUIREMENTS

1.2.1 Section 03 30 00 – Cast-In-Place Concrete: Coordinate placement of detector loops in concrete slabs.
1.2.2 Section 04 81 00 – Unit Masonry Assemblies
1.2.3 Section 05 50 00 – Metal Fabrications: Miscellaneous steel supports brackets and steel jambs.
1.2.4 Drawing A0.06 – Exterior Door Schedule, Door and Frame Elevations: Door and frame types and sizes, fire ratings, glass requirements and hardware groups.
1.2.5 Section 08 71 00 – Door Hardware: Lock cylinders and keying.
1.2.6 Section 09 91 00 – Painting: Site applied paint finish.
1.2.7 Division 26 – Electrical: Electrical service and connections for powered operators and accessories.
1.2.8 Division 28 – Electronic Safety and Security: Card readers and other interface controls.

1.3 DEFINITIONS

1.3.1 Operation Cycle: One cycle of a door is complete when it is moved from the closed position to the fully open position and returned to the closed position.

1.4 REFERENCE STANDARDS

1.4.1 American Society for Testing and Materials (ASTM):

1.4.1.1 ASTM A36/A36M-12, Standard Specification for Carbon Structural Steel
1.4.1.2 ASTM A123/A123M-13, Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products
1.4.1.3 ASTM A653/A653M-11, Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process
1.4.1.4 ASTM A666-10, Standard Specification for Annealed or Cold-Worked Austenitic Stainless Steel Sheet, Strip, Plate, and Flat Bar
1.4.1.5 ASTM B209/B209M-07, Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate
1.4.1.6 ASTM B221-13, Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes

1.5 ADMINISTRATIVE REQUIREMENTS

1.5.1 Coordination: Coordinate wiring requirements and electric characteristics of motors and connection to building electrical system and work of other Sections affected by work of this Section.

1.6 SUBMITTALS

1.6.1 Provide required information in accordance with[Section 01 33 00 – Submittal Procedures].
1.6.2 Action Submittals: Provide the following submittals before starting any work of this Section:

1.6.2.1 Product Data: Submit product data for each type and size of overhead coiling door and accessory including the following:

1.6.2.2 Shop Drawings: Submit shop drawings for special components and installations not dimensioned or detailed in manufacturer's product data.

1.6.2.3 Samples for Initial Selection: Submit manufacturer's colour charts showing full range of colours available for units with factory applied finishes for initial selection.

1.6.3 Sustainable Design Submittals: Coordinate project sustainable design requirements with Section 01 35 31 - LEED Special Project Procedures and Section 01 35 31A - LEED Material Information Sheet for LEED Submittals.

1.7 PROJECT CLOSEOUT SUBMISSIONS

1.7.1 Operation and Maintenance Data: Submit manufacturer’s written instructions for operations and maintenance procedures, include name of original installer and contact information in accordance with Section 01 78 23 – Operation and Maintenance Data:

1.7.1.1 Submit proposal for annual maintenance, testing and servicing fees for Owner’s consideration, and effective after expiration of 1 year warranty service required under Contract.

1.7.1.2 Submit manufacturer’s brochures and parts list describing actual materials used for installed system.

1.8 QUALITY ASSURANCE

1.8.1 Qualifications: Provide proof of qualifications when requested by Consultant:

1.8.1.1 Manufacturer: Obtain products listed in this Section from listed manufacturers and that have local distribution and servicing facilities.

1.8.1.2 Installers: Use installers that have completed manufacturer’s authorized training program and that are certified to install and maintain units delivered for this Project.

1.8.1.3 Source Limitations: Obtain products through one source from a single manufacturer; obtain electrical operators and controls from overhead coiling door manufacturer supplying products to this project.

1.9 SITE CONDITIONS

1.9.1 Site Measurements: Verify dimensions by site measurements before fabrication and indicate measurements on shop drawings where overhead coiling doors are required to fit within openings; coordinate fabrication schedule with construction progress to avoid delaying the Work.

1.9.2 Established Dimensions: Establish dimensions and proceed with fabricating overhead coiling doors 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 MANUFACTURERS

2.1.1 Basis-of-Design Products: Products named in this Section were used as the basis-of-design for the project; additional manufacturers offering similar products may be incorporated into the work of this Section [provided they meet the performance requirements established by the named products and provided they submit requests for substitution in accordance with Section 01 62 00 – Product Options.

2.1.1.1 Basis-of-Design Product: Overhead Door Corporation
2.1.2 Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Project include the following:

2.1.2.1 Cookson Company
2.1.2.2 Cornell Ironworks
2.1.2.3 Dynamic Closures Corporation
2.1.2.4 Dynaflair Corp. Canada Inc.
2.1.2.5 Kinnear/Wayne-Dalton Corporation
2.1.2.6 McKeon Door Company

2.1.3 Substitutions: Consultant may consider additional manufacturers having similar products to Acceptable Materials Manufacturers listed above during the construction period, provided they meet the performance requirements established by the named products and provided they submit requests for substitution in accordance with 01 25 00 – Substitution Procedures before starting any work of this Section:

2.1.3.1 Do not use substitute materials to establish Bid Price.
2.1.3.2 Substitutions that appear as a part of the project without review and acceptance by the Consultant will be rejected, and replaced with one of the specified materials.

2.2 PERFORMANCE REQUIREMENTS

2.2.1 Structural Performance: Provide overhead coiling doors capable of withstanding the effects of gravity loads and the following loads and stresses without evidencing permanent deformation of door components:

2.2.1.1 Wind Loads: Minimum 0.40 kPa 1/50 year occurrence in accordance with the Building Code, acting inward and outward.

2.2.2 Operation Cycle Requirements: Provide overhead coiling door components and operators capable of operating for not less than 20,000 cycles, and for 10 to 20 cycles per day.

2.3 SERVICE DOORS

2.3.1 Curtains: Fabricate overhead coiling door curtain of interlocking slats, designed to withstand wind loading indicated, in a continuous length for width of door without splices with slats of thickness and mechanical properties recommended by door manufacturer for performance, size, and type of door indicated, and as follows:

2.3.1.1 Steel Door Curtain Slats: Zinc coated (galvanized), cold rolled structural steel (SS) sheet; in accordance with ASTM A653/A653M, Z275 coating designation:

2.3.1.1.1 Minimum Core Metal (Uncoated) Thickness: 0.72 mm.
2.3.1.1.2 Flat profile slats.

2.3.1.2 Insulation: Fill slat with manufacturer's standard rigid cellular polystyrene or polyurethane foam type thermal insulation; enclose insulation completely within metal slat faces.

2.3.1.3 Inside Curtain Slat Face: To match material of outside metal curtain slat.

2.3.2 End Locks and Wind Locks: Cast iron castings, galvanized after fabrication end locks, secured to curtain slats with galvanized rivets or high strength nylon; include locks on not less than alternate curtain slats for curtain alignment and resistance against lateral movement.

2.3.3 Bottom Bar: Consisting of 2 angles, each not less than 38 mm x 38 mm x 3 mm thick; aluminum extrusions to suit type of curtain slats.
2.3.4 Curtain Jamb Guides:

2.3.4.1 Fabricate curtain jamb guides of steel angles or channels and angles, with sufficient depth and strength to retain curtain, to allow curtain to operate smoothly, and to withstand loading.

2.3.4.2 Build up units with 5 mm minimum thickness thick galvanized steel sections in accordance with ASTM A36/A36M and ASTM A123/A123M.

2.3.4.3 Slot bolt holes for guide adjustment.

2.3.4.4 Provide removable stops on guides to prevent over travel of curtain, and a continuous bar for holding wind locks.

2.3.5 Hood:

2.3.5.1 Fabricate to act as weather seal and entirely enclose coiled curtain and operating mechanism at opening head with sealant joint bead profile at hood edge for applying joint sealant.

2.3.5.2 Contour to fit end brackets; roll and reinforce top and bottom edges for stiffness.

2.3.5.3 Provide closed ends for surface mounted hoods and provide fascia for any portion of between jamb mounting projecting beyond wall face; provide intermediate support brackets to prevent sagging.

2.3.5.4 Shape: Round.

2.4 ACCESSORIES

2.4.1 Weather Seals:

2.4.1.1 Replaceable, adjustable, continuous, compressible weather stripping gaskets fitted to bottom and top of exterior doors; 3 mm minimum thickness at door head; replaceable, continuous sheet secured to inside of hood.

2.4.1.2 Combination bottom weather seal and sensor edge for motor operated doors.

2.4.1.3 Replaceable, adjustable, continuous, flexible, 3 mm minimum thickness flexible vinyl, rubber, or neoprene seals at door jambs for a weather tight installation.

2.4.2 Push/Pull Handles: Push-up emergency operate doors, galvanized steel lifting handles on each side of door; with pull down straps or pole hooks for doors higher than 2100 mm.

2.4.3 Locking Device: Manufacturer's standard locking device assembly with lock, spring loaded dead bolt, operating handle, cam plate, and adjustable locking bar to engage through slots in tracks, and as follows:

2.4.3.1 Locking Bars: Single jamb side operable from inside and outside.

2.4.3.2 Lock Cylinder: Coordinate with Section 08 71 00.

2.4.4 Automatic Closing Device: Automatic closing device; inoperative during normal door operations, with closing governor unit to control downward speed of the door in accordance with requirements of NFPA 80; having an easily tested and reset release mechanism, designed to be activated by the following:

2.4.4.1 Governor: Centrifugal or viscous governor connected to activation component that releases and causes door to drop by gravitational force only at a rate of 150 mm per second.

2.4.4.2 Obstruction Sensing Safety Edge: Sensing edge causes door to stop and return to open when safety edge encounters an obstruction during normal closing mode.
2.5 COUNTERBALANCING MECHANISM

2.5.1 Counterbalance doors using adjustable tension, steel helical torsion spring mounted around steel shaft and contained in spring barrel connected to door curtain with barrel rings using manufacturer’s standard grease sealed or self lubricating graphite bearings for rotating members.

2.5.2 Fabricate spring barrel from hot formed, structural quality, welded or seamless carbon steel pipe, of sufficient diameter and wall thickness to support rolled up curtain without distortion of slats and to limit barrel deflection to not more than 2.5 mm/m of span under full load.

2.5.3 Fabricate spring balance from one or more oil tempered, heat treated steel helical torsion springs; size springs to counterbalance weight of curtain with uniform adjustment accessible from outside barrel; include cast steel barrel plugs to secure ends of springs to barrel and shaft.

2.5.4 Fabricate torsion rod for counterbalance shaft of cold rolled steel, sized to hold fixed spring ends and carry torsion load.

2.5.5 Provide manufacturer’s standard cast iron or cold rolled steel plate mounting brackets.

2.6 ELECTRIC DOOR OPERATORS

2.6.1 Motorized Operator: 1/2 hp, 208/240 Volt 3 Phase, with automatic reset current sensing overload protection of size and capacity recommended by manufacturer for specified door; factory pre-wired motor controls, starter, gear reduction unit, solenoid operated brake, clutch, control devices, integral gearing for locking door, and accessories required for proper operation, having the following characteristics:

2.6.1.1 Speed: Sized to open door from any position, at minimum 200 mm and maximum 300 mm per second.

2.6.1.2 Type: Poly-phase, medium induction type; with high starting torque, reversible, continuous duty, Class A insulated in accordance with NEMA MG 1.

2.6.1.3 Service Factor: In accordance with NEMA MG 1.

2.6.1.4 Motor Housing: Open drip proof type motor and controller with NEMA ICS 6, Type 1 enclosure for normally dry operating environment.

2.6.1.5 Limit Switches: Adjustable switches, interlocked with motor controls set for automatic door stop at fully opened and fully closed positions.

2.6.2 Disconnect Device: Hand operated disconnect to automatically engage chain and sprocket operator to release brake for emergency manual operation and disconnect from motor, without affecting timing of limit switch; mounted in and accessible location; with interlock device to automatically prevent motor from operating when emergency operator is engaged.

2.6.3 Door Operator Type: Wall mounted, jackshaft, gear head type door operator unit consisting of electric motor, enclosed worm gear running in oil primary drive, and chain and sprocket secondary drive; with quick disconnect release for manual operation.

2.6.4 Remote Control Station: Keyed, three button control station with push button controls labelled "Open", "Close", and "Stop"; with full guarded, surface mounted, heavy duty type, with general purpose NEMA ICS 6, Type 1 enclosure for normally dry operating environment; with keyed operator for exterior or secure operating environment.

2.6.5 Obstruction Detection Device: Photoelectric type automatic safety sensor capable of protecting full width of door opening; activation of sensor immediately stops and reverses downward door travel, to manufacturer’s standard.
2.6.6 Emergency Egress Release: Flush, wall mounted handle mechanism not dependent on electric power that allows door to open for egress in emergency; automatically resets motor drive without affecting limit switches; with return of handle to original position.

2.7 FINISHES

2.7.1 Manufacturer's standard powder coat finish consisting of primer and topcoat; custom colour to match adjacent cladding finish.

3 Execution

3.1 INSTALLATION

3.1.1 Install coiling doors and operating equipment and required hardware, jamb and head moulding strips, anchors, inserts, hangers, and equipment supports in accordance with manufacturer’s written instructions and as specified.

3.2 CLOSEOUT ACTIVITIES

3.2.1 Adjusting: Lubricate bearings and sliding parts; adjust doors to operate easily, free of warp, twist, or distortion [and with weather tight fit around entire perimeter.

3.2.2 Start-Up Services: Engage a factory authorized service representative to perform start-up service [in accordance with Division 01 – General Commissioning Requirements]

3.2.2.1 Complete installation and start-up checks in accordance with manufacturer's written instructions.

3.2.2.2 Test and adjust controls and safeties.

3.2.2.3 Replace damaged and malfunctioning controls and equipment.

3.2.3 Demonstration: Engage a factory authorized service representative to train Owner's maintenance personnel to test, adjust, operate, and maintain overhead coiling doors in accordance with Section 01 77 00 – Closeout Procedures.

END OF SECTION
1 General

1.1 SUMMARY

1.1.1 This Section includes requirements for supply and installation of the following:

1.1.1.1 Watertight doors and frames installed in Cistern & Water Entry Room 0008. Indicated as Cistern Access Hatch.

1.2 RELATED REQUIREMENTS

1.2.1 Section 01 12 00 – Phased Construction Summary
1.2.2 Section 01 31 13 - Project Co-ordination
1.2.3 Section 01 33 00 – Submittal Procedures
1.2.4 Section 01 35 31 - LEED Special Project Procedures
1.2.5 Section 03 30 00 - Structural Cast-in-Place Concrete
1.2.6 Section 09 91 00 – Painting: Site painting of factory primed steel units.

1.3 REFERENCE STANDARDS

1.3.1 Aluminum Association (AA):

1.3.1.1 ASD-1 Aluminum Standards and Data

1.3.2 American Society for Testing and Materials (ASTM):

1.3.2.1 ASTM B632/B632M-08, Standard Specification for Aluminum-Alloy Rolled Tread Plate.
1.3.2.2 ASTM F593-13a, Standard Specification for Stainless Steel Bolts, Hex Cap Screws, and Studs
1.3.2.3 ASTM F594-09e1, Standard Specification for Stainless Steel Nuts

1.3.3 North American Architectural and Metal Products (NAAMM):

1.3.3.1 "Metal Finishes Manual for Architectural and Metal Products” for recommendations for applying and designating finishes.

1.4 ADMINISTRATION REQUIREMENTS

1.4.1 Preconstruction Meeting: Arrange a pre-construction meeting in accordance with Section 01 31 19 – Project Meetings, and as follows:

1.4.1.1 Attendance will be required by the Contractor, major Mechanical and Electrical Subcontractors, and other subcontractors affected by work of this Section; purpose of meeting will be to discuss placement and type of watertight doors and obtain Consultant’s acceptance of locations before completing any permanent work of this Project.

1.4.2 Coordination: Determine specific locations and sizes for watertight doors needed to gain access to Cistern, and as follows:

1.4.2.1 Coordinate locations of all access panels in concrete walls with Consultant for size and location prior to installation.
1.5 SUBMITTALS

1.5.1 Provide required information in accordance with Section 01 33 00 – Submittal Procedures.

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

1.5.2.1 Product Data: Provide product data for door and frame assembly indicated, including construction details relative to materials, individual components and profiles, finishes for access doors and frames.

1.5.2.2 Shop Drawings: Provide coordination drawings drawn to scale and coordinating penetrations other construction. Show the following:
   1.5.2.2.1 Method of attaching door frames to surrounding construction.

1.5.3 Sustainable Design Submittals: Coordinate project sustainable design requirements with Section 01 35 31 – LEED® Special Project Procedures and Section 01 35 31A - LEED Material Information Sheet for LEED Submittals.

1.6 DELIVERY, STORAGE, AND HANDLING

1.6.1 Deliver materials to Project site ready use.

1.6.2 Exercise proper care in handling of Work so as not to disrupt finished surfaces.

1.6.3 Store materials under cover in a dry and clean location off the ground.

1.7 JOB CONDITIONS AND SEQUENCING

1.7.1 Coordinate with other trades any related work to avoid delay.

1.7.2 Mounting surfaces shall be straight and secure; substrates shall be of proper width.

1.7.3 Provide inserts and anchoring devices that will be built into other Work for installation of floor door.

1.7.4 Observe all appropriate OSHA safety guidelines for this work.

1.8 WARRANTY

1.8.1 Provide manufacturer's standard warranty. All floor doors shall be free from manufacturing defects in materials and workmanship for period of five (5) years from date of shipment. Should product fail to function in normal use within this period, manufacturer shall furnish new part at no charge. Special locks, finishes, and other special equipment (if applicable) shall be warranted by manufacturer of those products.

1.9 PROJECT CLOSEOUT SUBMISSIONS

1.9.1 Provide operations and maintenance information in accordance with Section 01 78 23 – Operations and Maintenance Data for smoke vents with pertinent details, spare parts lists and warnings against harmful maintenance materials and practices.
2 Products

2.1 MANUFACTURER

2.1.1 Acceptable Materials Manufacturers: Subject to compliance with requirements specified in this Section; where multiple listings of manufacturers occur, use any of the following listed manufacturers’ products in accordance with Section 01 62 00 – Product Options including the following:

2.1.1.1 Babcock-Davis
2.1.1.2 Bilco Company
2.1.1.3 Lexcan Ltd.
2.1.1.4 Maxam Metal Products Ltd.
2.1.1.5 Nystrom Inc.

2.1.2 Substitutions: Consultant may consider additional manufacturers having similar products to Acceptable Materials Manufacturers listed above during the construction period, provided they meet the performance requirements established by the named products and provided they submit requests for substitution in accordance with Section 01 25 00 – Substitution Procedures before starting any work of this Section:

2.1.2.1 Do not use substitute materials to establish Bid Price.
2.1.2.2 Substitutions that appear as a part of the project without review and acceptance by the Consultant will be rejected, and replaced with one of the specified materials.

2.2 MATERIALS

2.2.1 Aluminum Extrusion: Alloy 6061-T6 aluminum, mill finish, to ASTM B632, with protective paint finishes to safeguard effects of concrete.

2.2.2 Fasteners: Type No. 316 stainless steeel to ASTM F593 for bolts and ASTM F594 for nuts.

2.2.3 Performance Requirements: Fabricate well hatches for water-tightness to 3.05 m water column or 30 kPa load capacity:

2.2.3.1 Door: 6 mm reinforced aluminum diamond plate.
2.2.3.2 Frame: 50 mm x 75 mm x 6 mm aluminum angle.
2.2.3.3 Latch: Type 316 Stainless Steel pressure locks
2.2.3.4 Gasket Seal: EPDM rubber gasket seal, water and odor resistant
2.2.3.5 Hinges: Type 316 Stainless Steel 75 mm x 75 mm heavy duty butt hinges fastened to door with stainless steel carriage bolts.
2.2.3.6 Hold open arm: 10 mm, type 316 Stainless steel arm that automatically locks when door is opened to 90 degrees. Red vinyl grip handle for door release.
2.2.3.7 Acceptable Product Model: Nystrom FDWTA
2.2.3.8 Size 915 mm x 915 mm

2.3 FABRICATION

2.3.1 Provide watertight door assemblies manufactured as integral units ready for installation.

2.3.2 Latching Mechanisms: Furnish number required to hold doors in flush, smooth plane when closed based on size of door or panel opening.
2.3.3 Apply manufacturer's standard protective coating on aluminum that will come in contact with concrete after fabrication.

2.4 FINISHES

2.4.1 All steel cleaned to SP3 and red oxide primed.

3 Execution

3.1 INSTALLATION

3.1.1 Comply with manufacturer's written instructions for installing watertight doors and frame assemblies.

3.1.2 Set frames accurately in position and attach securely to supports with plane of face panels aligned with adjacent finish surfaces.

3.2 ADJUSTING AND CLEANING

3.2.1 Adjust doors and hardware after installation for proper operation.

3.2.2 Remove and replace doors and frame assemblies or components that are warped, bowed, or otherwise damaged.

END OF SECTION
1 General

1.1 SUMMARY

1.1.1 This Section includes requirements for supply and installation of conventionally glazed and structural sealant glazed aluminum curtain wall system utilizing toggle clip and unitized system consisting of the following:

1.1.1.1 Fixed, clear low emissivity (Low E) sealed glass units
1.1.1.2 Full length toggle plate and channel system and structural silicone adhered
1.1.1.3 Dry glazed from exterior with screw on toggle plate, keyed-in neoprene gasket and thermal break
1.1.1.4 Internal weep drainage and compartmentalization in accordance with established design principles for rain screen and pressure equalization in curtain wall systems
1.1.1.5 Snap-On covers
1.1.1.6 Delegated design of curtain wall system for horizontal wind loading and vertical deflection
1.1.1.7 Delegated design of anchorages, fasteners and metal fabrications required to attach curtain wall system to supporting structures.
1.1.1.8 All-Glass entrance doors installed in curtain wall framing.
1.1.1.9 Other manufacturer’s components required for a complete and functional curtain wall system installation.

1.1.2 Drawings contain details that suggest directions for solving some of the major design requirements; these details can be developed further by the trade Contractor provided that the final installation adheres to aesthetic criteria established by the drawings and specified dimensions with all elements in planes as drawn, maintaining their relationships with all other building elements.

1.2 RELATED REQUIREMENTS

1.2.1 Section 07 21 13.13 – Semi-Rigid Board Insulation: Site installed insulation materials in conjunction with glazed aluminum curtain wall systems.
1.2.2 Section 05 50 13 – Exterior Metal Fabrications: Supporting steel and assemblies required by this Section for connection to structural steel [and concrete] necessary for complete installation of curtain wall systems.
1.2.3 Section 05 75 00 – Decorative Formed Metal: Custom decorative metal fins
1.2.4 Section 07 84 00 – Firestopping: Perimeter fire containment systems site installed in conjunction with glazed aluminum curtain wall systems.
1.2.5 Section 07 92 00 – Joint Sealants: Sealants installed with glazed aluminum curtain wall systems.
1.2.6 Drawing A0.06 – Exterior Door Schedule, Door and Frame Elevations: Door and frame types and sizes, fire ratings, glass requirements and hardware groups.
1.2.7 Section 08 63 00 – Metal Framed Skylights
1.2.8 Section 08 81 00 – Glass and Glazing: Insulating glass requirements.
1.2.9 Section 11 24 23 – Building Maintenance Equipment (BME)

1.3 DEFINITIONS

1.3.1 Delegated Design Professional Engineer: The professional engineer hired or contracted to the fabricator or manufacturer to produce delegated design submittals and shop drawings to meet the requirements of the Project, and registered in the province of the Work, and who is not the Consultant.
1.3.2 Equal Dimensions: Curtain wall assemblies indicating equal dimensions on the
drawings shall be calculated to align with in-place structural elements followed by
even division of the space between structural elements. This shall mean that
curtain wall materials are evenly spaced between adjacent structural members,
not necessarily evenly spaced across the entire wall assembly.

1.4 REFERENCE STANDARDS

1.4.1 Aluminum Association (AA):
1.4.1.1 Aluminum Design Manual, 2010

1.4.2 American Architectural Manufacturer's Association (AAMA):
1.4.2.1 AAMA 501-05, Methods of Test for Exterior Walls
1.4.2.2 AAMA 501.4-09, Recommended Static Test Method for Evaluating
Curtain Wall and Storefront Systems Subjected to Seismic and Wind
Induced Interstory Drifts
1.4.2.3 AAMA 501.6-09, Recommended Dynamic Test Method for Determining
The Seismic Drift Causing Glass Fallout From A Wall System
1.4.2.4 AAMA 1503-98, Voluntary Test Method for Thermal Transmittance and
Condensation Resistance of Windows, Doors and Glazed Wall
Sections
1.4.2.5 AAMA 2605-02, Voluntary Specification, Performance Requirements
and Test Procedures for Superior Performance Organic Coating on
Aluminum Extrusions and Panels
1.4.2.6 AAMA CW-13-85, Structural Silicone Glazing Systems
1.4.2.7 AAMA CW-DG-1-96, Curtain Wall Design Guide
1.4.2.8 AAMA CWG-1-89, Installation of Aluminum Curtain Walls
1.4.2.9 AAMA CW-RS-1-96, The Rain Screen Principle and Pressure
Equalized Wall Design
1.4.2.10 AAMA RPC-00, Rain Penetration Control: Applying Current Knowledge

1.4.3 American Society for Testing and Materials (ASTM):
1.4.3.1 ASTM A167-99(2009), Standard Specification for Stainless and Heat-
Resisting Chromium-Nickel Steel Plate, Sheet, and Strip
1.4.3.2 ASTM A653/A653M-11, Standard Specification for Steel Sheet, Zinc-
Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the
Hot-Dip Process
1.4.3.3 ASTM B209-10, Standard Specification for Aluminum and Aluminum-
Alloy Sheet and Plate
1.4.3.4 ASTM B221-13, Standard Specification for Aluminum and Aluminum-
Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes
1.4.3.5 ASTM B429/B429M-10e1, Standard Specification for Aluminum-Alloy
Extruded Structural Pipe and Tube
1.4.3.6 ASTM C920-11, Standard Specification for Elastomeric Joint Sealants
1.4.3.7 ASTM C1135-00 (2011), Standard Test Method for Determining Tensile
Adhesion Properties of Structural Sealants
1.4.3.8 ASTM C1184-05, Standard Specification for Structural Silicone
Sealants
1.4.3.9 ASTM E283-04 (2012), Standard Test Method for Determining the Rate
of Air Leakage through Exterior Windows, Curtain Walls, and Doors
under Specified Pressure Differences across the Specimen
1.4.3.10 ASTM E330-02 (2010), Standard Test Method for Structural
Performance of Exterior Windows, Curtain Walls, and Doors by
Uniform Static Air Pressure Difference
1.4.3.11 ASTM E331-00 (2009), Standard Test Method for Water Penetration of
Exterior Windows, Skylights, Doors, and Curtain Walls by Uniform
Static Air Pressure Difference
1.4.4 Canadian Standards Association (CSA):
   1.4.4.1 CSA A440.2-14/A440.3-14, Fenestration energy performance/User
guide to CSA A440.2-14, Includes Update No. 1 (2015)
   1.4.4.2 CSA G40.20-13/G40.21-13, General Requirements for Rolled or
Welded Structural Quality Steel Structural Quality Steel
   1.4.4.3 CSA S157-05(R2010), Strength Design in Aluminum / Commentary on
CSA S157-05, Strength Design in Aluminum
   1.4.4.4 CSA W47.1-09, Certification of Companies for Fusion Welding of Steel
   1.4.4.5 CSA W47.2-11, Certification of Companies for Fusion Welding of
Aluminum
   1.4.4.6 CSA W59-03 (R2008), Welded Steel Construction (Metal Arc Welding),
Metric
   1.4.4.7 CSA W59.2-1991 (R2008), Welded Aluminum Construction

1.4.5 Canadian Welding Bureau (CWB Group Industry Services):
   1.4.5.1 CWB 112E, 93-1, Welding Symbols Study Guide
   1.4.5.2 CWB 113E, 94-1, Weld Quality and Examination Methods Study Guide

1.4.6 National Fenestration Rating Council (NFRC):
   1.4.6.1 NFRC 100-2010 Procedure for Determining Fenestration Product U-
Values

1.4.7 The Society for Protective Coatings (SSPC)/National Association of Corrosion
Engineers (NACE International):
   1.4.7.1 Surface Preparation Guidelines:
      1.4.7.1.1 SSPC-SP COM Surface Preparation Commentary for Steel
      and Concrete Substrates
      1.4.7.1.2 SSPC-PS Guide 12.00, Guide to Zinc-Rich Coating Systems

1.4.8 Underwriters Laboratories of Canada (ULC):
   1.4.8.1 CAN/ULC S702-09, Standard for Thermal Insulation Mineral Fibre for
Buildings

1.5 ADMINISTRATIVE REQUIREMENTS

1.5.1 Pre-Construction Meeting: Conduct a pre-construction meeting in accordance
with Section 01 31 19 – Project Meetings attended by Construction Manager,
Trade Contractor, Consultant and other Trade Contractor’s affected by work of
this Section on site to verify project requirements, and review methods and
procedures related to glazed aluminum curtain wall systems including the
following:
   1.5.1.1 Review structural load limitations and deflection criteria of adjacent
construction, support systems and curtain wall system.
   1.5.1.2 Review installation and substrate and structure conditions affecting
work of this Section.
   1.5.1.3 Review requirements of this Section for connection to substrates and
structures provided by other Sections.
   1.5.1.4 Review of metal fabrications, anchors and fasteners required by and
provided by this Section to other components of the work.
   1.5.1.5 Review and finalize construction schedule and verify availability of
materials, installer’s personnel, equipment, and facilities needed to
make progress and avoid delays.
   1.5.1.6 Review location and alignment of vertical and horizontal elements as
they relate to the aesthetic criteria and technical requirements
indicated on the shop drawings.
   1.5.1.7 Review written installation instructions and warranty requirements.
1.5.1.8 Review other or additional installation requirements not otherwise covered by the suggested listing of topics.

1.5.2 Coordination: Coordinate installation of curtain wall system with work specified in other Sections to ensure correct placement and installation of vapour barrier, insulation and flashing to maintain continuity of building air, vapour and thermal barrier and to divert moisture and water to the exterior, and as follows:

1.5.2.1 Coordinate installation of sealants so that ambient and surface temperatures are greater than 5°C from time of application until sealants have cured.

1.5.2.2 Coordinate connection of curtain wall system structural connections to horizontal building structures and vertical members.

1.5.2.3 Coordinate design of curtain wall elements to tie into adjacent building envelope elements.

1.5.2.4 Coordinate fabrication of miscellaneous steel, anchorages and fasteners required by curtain wall system for complete installation.

1.5.2.5 Coordinate Work of this Section with installation of firestopping, installation of ductwork to rear of louvres, and adjacent components or materials.

1.5.2.6 Coordinate work of this Section with structural silicone adhered glazing applications; sealant manufacturer’s technical service representative must review installation conditions before starting fabrication or installation; submit an engineered and certified installation report prior to construction for review.

1.5.3 Delegated Design Requirements: Coordinate design of glazed curtain wall with glass thicknesses, size and configuration of curtain wall components, and connections to structural steel in accordance with referenced standards and requirements of this Section.

1.6 SUBMITTALS

1.6.1 Provide required information in accordance with Section 01 33 00 – Submittal Procedures.

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

1.6.2.1 Product Data: Submit product data indicating construction details, material descriptions, dimensions of individual components and profiles, and finishes for each type of product indicated, in addition to the following specific requirements:

1.6.2.1.1 Mechanical Fasteners: Indicate sizes, shear, and pull over loading capacity where applicable.

1.6.2.1.2 Corrosion Protection: Indicate thickness and type of corrosion protection coating.

1.6.2.2 Shop Drawings: Submit shop drawings prepared by or under the supervision of a qualified professional engineer detailing fabrication and assembly of glazed aluminum curtain wall systems clearly indicating all construction details including the following:

1.6.2.2.1 Connections and anchor requirements.

1.6.2.2.2 Metal fabrications integral with aluminum curtain wall system installation.

1.6.2.2.3 Type, size and spacing of fastening devices.

1.6.2.2.4 Design loads.

1.6.2.2.5 Connections to adjacent air and vapour membranes.

1.6.2.2.6 Internal drainage and sealant locations.
1.6.2.2.7 Seal of a professional engineer registered in the Province of the Work for details requiring structural design for load bearing, or life and health safety.
1.6.2.2.8 Other detailed requirements for installation.

1.6.2.3 Samples: Submit samples for each type of exposed finish required, in manufacturer's standard sizes for Consultant's verification of specified finishes.

1.6.3 Informational Submittals: Provide the following:

1.6.3.1 Qualification Statement: Submit evidence of welder qualifications specified in this Section when requested by Consultant.
1.6.3.2 Source Quality Control Submittals: Submit delegated design professional engineer's design notes and calculations when requested by Consultant.
1.6.3.3 Manufacturer's Installation Instructions: Submit manufacturer’s installation instructions for transition membrane assembly when requested by Consultant.
1.6.3.4 Delegated Design Submittals: Submit letters of commitment and compliance in accordance with Section 01 33 50 – Delegated Design Submittals as follows:

1.6.3.4.1 Provide Letter of Commitment in conjunction with shop drawings, signed and sealed by the professional engineer required by the Work of this Section indicating the following are designed to the intent of the Building Code:

- Curtain wall connections to building structure
- Curtain wall deflection connections to building structure
- Curtain wall reinforcement
- Deflection of members
- Glass thickness as they relate to glass area and applied horizontal loads

1.6.3.4.2 Provide Letter of Compliance, signed and sealed by the professional engineer required by the Work of this Section indicating that connections, reinforcement and deflection criteria, and glass thickness of installed system is in compliance with the intent of the Building Code and reviewed shop drawings before declaration of Substantial Performance.

1.6.3.5 Sustainable Design Submittals: Coordinate project sustainable design requirements with Section 01 35 31 - LEED Special Project Procedures and Section 01 35 31A - LEED Material Information Sheet for LEED Submittals; including the following:

1.6.3.5.1 A Design Service Life (DSL) of 50 years has been selected for the New Central Library. Submit a letter from the manufacturer confirming that the metal panels will have a Predicted Service Life (PSL) of at least half of the life of the building.

1.7 PROJECT CLOSEOUT SUBMISSIONS

1.7.1 Submit data for cleaning of aluminum finishes and maintenance of structural silicone glazing system in accordance with Section 01 78 23 – Operations and Maintenance Data.

1.8 QUALITY ASSURANCE

1.8.1 Qualifications:
1.8.1.1 Installer: Installer shall be capable of assuming delegated design engineering responsibility, performing Work of this Section and who is acceptable to manufacturer for the type of work specified.

1.8.1.2 Delegated Design Professional: Retain a Professional Engineer, registered in the Province of the Work, to design fabrication and erection of the Work of this Section in accordance with applicable Building Code and Contract Documents requirements including the following:

1.8.1.2.1 Seal and signature to shop drawings and design submittals
1.8.1.2.2 Site review of installed components
1.8.1.2.3 Submittal of required letters of commitment and compliance

1.8.2 Certifications: Provide the following during the course of the Work:

1.8.2.1 Compliance Certification: Provide certificates from manufacturer indicating tested performance requirements required by Authorities Having Jurisdiction.

1.8.2.2 Letters of Commitment and Compliance: Provide documents prepared by the delegated design professional engineer as recommended by APEGA’s Responsibilities for Engineering Services for Building Projects in accordance with Section 01 33 50 – Delegated Design Submittals.

1.9 MOCK-UPS

1.9.1 Provide Mock-Ups and sample installations in accordance with Section 01 45 00 – Quality Control to demonstrate aesthetic effects and set quality standards for fabrication and installation as follows:

1.9.2 Fabricate sample mock-up for laboratory testing in Florida, USA prior to manufacture of assemblies. Manufacturing of assemblies to only proceed based on approved mock-up.

1.9.3 Build mock up(s) of typical wall area(s) as shown on attached Drawings. Assembly and construction to proceed based on approved mock-up(s) only.

1.9.4 Construct mock-ups for each form of construction and finish required to verify selections made under sample submittals and to demonstrate aesthetic effects and qualities of materials and execution before installing wall panels.

1.9.5 Build mock-ups to comply with the following requirements, using exposed and concealed materials indicated for the completed Work, and as follows:

1.9.5.1 Locate mock-ups in the location and of the size indicated or, if not indicated, as directed by Consultant.

1.9.5.2 Demonstrate the proposed range of aesthetic effects and workmanship, connections and relationship to adjacent materials.

1.9.5.3 Construct mock-up indicating relationship between wall panels, air spaces, air/vapour retarder membrane, windows, and doors.

1.9.5.4 Obtain Consultant’s acceptance of mock-ups before proceeding with construction of wall panels.

1.9.5.5 Maintain mock-ups during construction in an undisturbed condition as a standard for judging the completed Work.

1.9.5.6 Acceptable mock-ups in an undisturbed condition at the time of Substantial Performance may become part of the completed Work.

1.9.5.7 Provide for 3 changes in vision and spandrel glazing colour selection as selected by Consultant.

1.9.5.8 Back-painted glass mock-up, consisting of one clear rectangular unit + one back painted unit with 5 strips of colour directly adjacent to one another
1.9.5.9 Full-scale visual mock-up of two adjacent units using brakeshapes, etc to represent mullion and panel conditions (colours will be approximate, but not fully representative, mock-up to occur in their shop). Mock-up will include stack joint conditions (fire-stopping enclosures etc), as well as at least one example of each panel type.

1.9.5.10 Mock-up of juncture of curtain wall and wood soffit prepared by StructureCraft.

1.9.6 Consultant will review mock-up and may request minor changes to enhance performance or aesthetic appearance, and as follows:

1.9.6.1 Unaccepted mock-ups shall be removed, repaired, or rebuilt as required to meet project requirements.

1.9.6.2 Installer will be entitled to claim for increased costs where changes requested by Consultant require an additional cost to the system.

1.9.7 Costs will not be reimbursable and changes will be made to meet indicated details before acceptance by Consultant where increased costs arise from not following Consultant’s design drawings.

1.10 DELIVERY, STORAGE AND HANDLING

1.10.1 Delivery and Acceptance Requirements: Deliver, handle and store prefabricated units in accordance with manufacturer’s directions.

1.10.2 Storage and Handling Requirements: Store units at site on raised wood pallets protected from the elements and corrosive materials, and as follows:

1.10.2.1 Do not remove from crates or other protective covering until ready for installation.

1.10.2.2 Store all glass units vertically on end with solid bearing full thickness of sealed units.

1.10.2.3 Store pre-fabricated frame assemblies blocked off the ground to prevent warping, twisting, undue strain on assembly or physical abuse and damage.

1.11 SITE CONDITIONS

1.11.1 Site Measurements: Verify dimensions of other construction by site measurements before fabrication and indicate measurements on shop drawings where aluminum curtain wall systems are indicated to fit to other construction.

1.11.2 Established Dimensions: Establish dimensions and proceed with fabricating aluminum curtain wall without site measurements where site measurements cannot be made without delaying the Work, coordinated with other construction to ensure that actual dimensions correspond to established dimensions.

1.11.3 Ambient Conditions: Confirm installation requirements for ambient and surface temperatures of sealants with manufacturer and apply sealants when temperatures are greater than manufacturer’s stated minimum from time of application until sealants have cured.

1.12 WARRANTY

1.12.1 Special Assembly Warranty: Provide manufacturer’s written warranty, signed and issued in the name of Owner stating that they agree to repair or replace the following items for defective material and workmanship for the time stated from date of Substantial Performance:

1.12.1.1 Structural failures resulting from excessive deflection.

1.12.1.2 Noise or vibration caused by thermal movements.

1.12.1.3 Deterioration of metals, metal finishes and other materials beyond normal weathering.

1.12.1.4 Adhesive of cohesive sealant failures, and failure to maintain a seal.

1.12.1.5 Water leakage through fixed glazing and framing areas.
1.12.1.6 Failure of operating components to function properly.
1.12.1.7 Warranty Term: Five (5) years.

1.12.2 Special Glass Warranty: Provide manufacturer’s written warranty, signed and issued in the name of Owner stating that they will replace sealed glass units that exhibit misting, dusting and seal failures as indicated in Section 08 81 00 – Glass Glazing.

1.12.3 Special Finish Warranty:
1.12.3.1 Exterior Finishes: Provide manufacturer’s written coating warranty stating that they agree to repair or replace components on which finishes fail within twenty (20) years from date of Substantial Performance and that are not attributable to normal weathering.
1.12.3.2 Interior Finishes: Provide manufacturer’s written coating warranty stating that they agree to repair or replace components on which finishes fail within twenty (20) years from date of Substantial Performance.

1.13 TESTING
1.13.1 Preconstruction Testing Program: Developed specifically for Project.
1.13.2 Preconstruction Test Reports: For glazed aluminum curtain-wall systems.
1.13.3 Field quality-control test reports.
1.13.4 Testing Agency Qualifications: An independent agency qualified according to ASTM E 699 for testing indicated.
1.13.5 Preconstruction Testing Service: Owner will engage a qualified independent testing agency to test glazed aluminum curtain-wall systems for compliance with specified requirements for performance and test methods. Provide test specimens and assemblies representative of proposed materials and construction.
1.13.6 Select sizes and configurations of assemblies to adequately demonstrate capability of glazed aluminum curtain-wall systems to comply with performance requirements and according to AAMA 501 recommendations.
1.13.7 Mock-ups: Build mock-ups to demonstrate aesthetic effects and set quality standards for fabrication and installation.
1.13.8 Build mock-up of typical wall area as shown on attached Drawings.
1.13.9 Testing shall be performed on mockups according to requirements in Part 3.

2 Products
2.1 MANUFACTURERS
2.1.1 Basis-of-Design Materials: Products named in this Section were used as the basis-of-design for the project; manufacturers listed as additional acceptable materials 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.
2.1.1.1 Basis-of-Design Material: Ferguson Corporation

2.2 DESIGN CRITERIA
2.2.1 Coordinate delegated design requirements with Section 01 33 50 – Delegated Design Submittals.
2.2.2 Retain a professional engineer registered in province of Work, experienced in structural design in glass and aluminum to design curtain wall units, structural silicone glazing system, and connections; to ensure the adequacy of the structural aspects of the design, manufacture, and installation of complete assembly; this engineer is called the "delegated design professional engineer" as defined in item 1.3.1 above.

2.2.3 Design curtain wall framing system capable of withstanding design loads within limits and under design loads indicated in this Section, and as follows:

2.2.3.1 Dead Loads: Account for weights of materials and construction accessories.

2.2.3.2 Structural Loads:

2.2.3.2.1 Wind Loads: 0.50 kPa 1/50 year occurrence in accordance with the Building Code.

2.2.3.2.2 Other Design Loads and Conditions: Design system components to accommodate the following without damage to components or deterioration of seals:

- Movement within system
- Movement between system and perimeter framing components
- Dynamic loading and release of loads
- Deflection of structural support framing
- Shortening of building concrete structural columns
- Creep of horizontal structural support members
- Mid-span structural support deflection of 19 mm

2.2.3.3 Deflection of Framing Members:

2.2.3.3.1 Deflection Normal to Wall Plane: Limited to L/175 of clear span for spans up to 4100 mm, and to L/240 of clear span plus 6 mm or spans greater than 4100 mm or an amount that restricts edge deflection of individual glazing lites to 19 mm, whichever is less.

2.2.3.3.2 Deflection Parallel to Glazing Plane: Limited to amount not exceeding an amount that reduces glazing bite to less than 75% of design dimension and that reduces edge clearance between framing members and glazing or other fixed components to less than 3 mm.

2.2.3.3.3 Limit length of cantilever deflection to L/175 length of the cantilevered member where framing members overhang an anchor point.

2.2.3.3.4 Deflection limits shall be such that the integrity of the glass and seals will be maintained at design loading. Permanent deformation of members due to applied loads not permitted. Notwithstanding limits specified herein, assemblies shall not deflect under design loads sufficient to cause noise, breaking of glass, adhesives or sealant, to cause components to touch other components which they were not designed to contact, or building structure, or to break the integrity of the insulation thermal blanket or air/vapour barrier seals.

2.2.4 Performance Requirements: Design, engineer, test, fabricate, deliver, install and guaranty construction necessary to provide and install aluminum curtain wall and structural silicone adhered glazing systems including anchorage capable of withstanding without failure, the effects of the following:

2.2.4.1 Structural loads listed above.

2.2.4.2 Environmental movements and performance criteria listed below.
2.2.4.3 Movements of supporting structure indicated on Drawings including story drift, twist, column shortening, long-term creep, and deflection from uniformly distributed and concentrated live loads.

2.2.4.4 Dimensional tolerances of building frame and other adjacent construction.

2.2.4.5 Failure of the system will be considered as:

2.2.4.5.1 Deflection exceeding specified limits.
2.2.4.5.2 Thermal stresses transferred to building structure.
2.2.4.5.3 Framing members transferring stresses, including those caused by thermal and structural movements, to glazing.
2.2.4.5.4 Noise or vibration created by wind and thermal and structural movements.
2.2.4.5.5 Loosening or weakening of fasteners, attachments, and other components.
2.2.4.5.6 Sealant failure.

2.2.5 Environmental Conditions: Design curtain wall systems to account for the following environmental conditions:

2.2.5.1 Story Drift: Provide glazed aluminum curtain wall systems that accommodate design displacement of adjacent stories under combined wind and gravity loads in accordance with the Building Code, and as follows:
2.2.5.1.1 Design Displacement: H/500.

2.2.5.2 Thermal Movements: Allow for thermal movements resulting from the following maximum change (range) in ambient temperatures, accounting for surface temperatures of materials due to both solar heat gain and night time sky heat loss:
2.2.5.2.1 Temperature Change (Range):
   - Exterior Ambient: -40°C to +55°C
   - Interior Ambient: +16°C to +29°C
   - Adjust calculations to account for colour treatments or coatings on curtain wall framing members.
2.2.5.2.2 Allow for thermal movement with no buckling of frame members, stress on glass, glazing edge seal failure, sealant failure, excess stress on curtain wall framing, anchors and fasteners, or reduction of performance.

2.2.5.3 The design of the curtain wall aluminum framing, shall incorporate a thermal-break system so that no condensation shall form on any interior surfaces of the aluminum members before any of the exposed glass area of the sealed units reaches the dew point temperature when subjected to the specified environmental conditions. Thermally, the grid members shall have a resistance to heat transfer equal to or better than that of the area along the bottom of the sealed glass units with the selected spacer edge construction.

2.2.5.4 Air Infiltration: Design system for maximum air leakage of 0.3 L/s m² of fixed wall area when tested in accordance with ASTM E283 at a minimum static air pressure differential of 300 Pa.
2.2.5.5 Water Penetration Under Static Pressure: Design system for zero water penetration when tested in accordance with ASTM E331 at a minimum differential static pressure of 20% of positive design wind load; but not less than 720 Pa.
2.2.5.3 Average Thermal Conductance: Combined glass and framing Design system having average insulation factor of not more than 1.4756 W/m²K when tested in accordance with AAMA 1503 using high performance glass specified in Section 08 81 00.

2.3 MATERIALS

2.3.1 Aluminum: Materials recommended by manufacturer for type of use and finish indicated, and as follows:

2.3.1.1 Sheet and Plate: In accordance with ASTM B209/B209M, and ANSI H35.1 AA1100-H14, or AA5005-H32 or H34, anodizing quality.

2.3.1.2 Extruded Bars, Rods, Profiles, and Tubes: In accordance with ASTM B221, and ANSI H35.1 AA6063-T5 or T6, anodizing quality.

2.3.1.3 Extruded Structural Pipe and Tubes: In accordance with ASTM B429, and ANSI H35.1 AA6061-T6 or AA6063-T6, anodizing quality.

2.3.1.4 Structural Profiles: In accordance with ASTM B308/B308M, anodizing quality.

2.3.1.5 Welding Rods and Bare Electrodes: CSA W59.2.

2.3.2 Steel Reinforcement: Coat steel with manufacturer's standard corrosion resistant primer applied immediately after surface preparation and pre-treatment, and as follows:

2.3.2.1 Rolled Sheet or Strip: CSA G40.20/G40.21.

2.3.2.2 Structural Shapes, Plates and Bars: CSA G40.20/G40.21.

2.3.3 Brackets and Reinforcements: Manufacturer's standard high strength aluminum with non-staining, nonferrous shims for aligning system components.

2.3.4 Metal Fabrications and Attachments: Manufacturer's required steel fabrications and attachments for connecting to deflection control assemblies and structural support systems.

2.3.5 Fasteners and Accessories: Manufacturer's standard corrosion-resistant, non-staining, non-bleeding fasteners and accessories compatible with adjacent materials.

2.3.5.1 Use self-locking devices where fasteners are subject to loosening or turn out from thermal and structural movements, wind loads, or vibration.

2.3.5.2 Reinforce members to receive fastener threads.

2.3.5.3 Use only concealed fasteners, unless use of exposed fasteners has been accepted in writing by the Consultant.

2.3.5.4 Finish exposed portions to match framing system.

2.3.5.5 Use slip joint linings, spacers, and sleeves at movement joints of material and type recommended by manufacturer.

2.3.6 Anti-Rotation Channels: Manufacturer's recommended extruded aluminum, or reinforced nylon anti-rotation channel designed to retain air seal membrane through pressure to the face of the tubular back section and prevent rotation of toggle plate.

2.3.7 Anchors: Three way adjustable anchors that accommodate fabrication and installation tolerances in material and finish compatible with adjoining materials and recommended by manufacturer.

2.3.8 Concealed Flashing: Manufacturer's standard corrosion resistant, non-staining, non-bleeding flashing compatible with adjacent materials.

2.3.9 Transition Membranes: Full length self adhering SBS modified bitumen reinforced membrane; having low temperature formulation appropriate for installation requirements and compatible with materials specified in Section 07 25 13.
2.3.10 Glazing Gaskets: Manufacturer’s standard sealed corner pressure glazing system of black, resilient elastomeric glazing gaskets, setting blocks, and shims or spacers; as recommended by manufacturer for joint type.

2.4 FRAMING SYSTEM: STRUCTURAL SILICONE

2.4.1 Frame Type: To profiles indicated on drawings, not less than 3 mm wall thickness, of suitable alloy and proper temper for extruding and adequate structural characteristics, suitable for finishing as specified and as follows:

2.4.1.1 Glazing throat length to suit thickness of sealed glass unit.
2.4.1.2 Back Frame Profile: nominal 100 mm high and nominal mullion depth as indicated on curtain wall and window frame elevations.
2.4.1.3 Basis-of-Design Materials:

2.4.1.3.1 Ferguson Corporation, Ferguson 1400 Series – Custom, and Ferguson 130 Toggle - Custom

2.5 OPERABLE DOOR UNITS

2.5.1 Doors: Custom glazed doors with stainless steel trim for swing operation, reinforced as required to withstand traffic conditions.

2.5.2 Custom Door:

2.5.2.1 Construction: Monolithic 13 mm tempered glass with stainless steel top and bottom rail and vertical stainless steel trim. Edge brush matching width of top and bottom rail.
2.5.2.2 Dimensions: Nominal 76 mm top and bottom rail
2.5.2.3 Finish: Stainless Steel type 304, No.3 Directional Finish

2.5.3 Door Pulls: BHMA-certified (ANSI/BHMA Grade 1, Type 2

2.5.3.1 Finish: Stainless Steel
2.5.3.2 Basis-of-Design Manufacturer: DORMA, DG1100

2.5.4 Door Pivot: Concealed, centre pivot

2.5.4.1 Basis-of-Design Manufacturer: LCN, 2860 Series

2.5.5 Pedestal:

2.5.5.1 Custom fabricated rectangular bollard of nominal size 75 mm x 150 mm, with high and low curved switch and adapter for card reader, welded flat top. Stainless Steel type 304, No.3 Directional Finish.
2.5.5.2 Mounting: 13 mm diameter x 70 mm long heavy duty expansion anchors. Bollard to be epoxy set into bracket as indicated on Drawings in Bid Package 2.

2.5.6 Weatherstripping:

2.5.6.1 Basis-of-Design Manufacturer: CRL translucent Bulb Seal SDTB adhered with CRL Very Hi-Bond Transparent Acrylic Adhesive Tape AT040236 and edge brush on vertical trim.

2.5.7 Threshold:

2.5.7.1 Aluminum full width of frame, for exterior doors only.

2.6 GLAZING SYSTEMS

2.6.1 Glass: Specified in Section 08 81 00.

2.6.2 Glazing Gaskets: Manufacturer’s standard sealed corner pressure glazing system of black, resilient elastomeric glazing gaskets, setting blocks, and shims or spacers.
2.6.3 Standard Glazing Sealants: As recommended by manufacturer for joint type with materials used on interior side of vapour barrier having a maximum VOC limit of 250 g/L in accordance with SCAQMD Rule 1168.

2.6.4 SSG System Glazing Sealants: As recommended by manufacturer for joint type and as follows:

2.6.4.1 Structural Sealant: Structural silicone based on Type S-4 as specified in Section 07 92 00, compatible with other glazing materials specified in Section 08 81 00; and as follows:

2.6.4.1.1 Type: Manufacturer's standard single or two component neutral curing silicone formulation meeting requirements of ASTM C1184.

2.6.4.1.2 Modulus of Elasticity: As required by structural sealant glazed curtain wall system design to meet performance requirements.

2.6.4.1.3 Tensile Adhesion: Minimum tensile strength: 690 kPa when tested in accordance with ASTM C1135, specifically formulated for use as structural sealant, and approved by structural sealant manufacturer for use in specified curtain wall systems.

2.6.4.1.4 Colour: Black.

2.6.4.1.5 Structural silicone sealants shall be designed and certified by manufacturer’s engineer.

2.7 ACCESSORIES

2.7.1 Insulated Spandrel Panels:

2.7.1.1 Spandrel Glass: Specified in Section 08 81 00.

2.7.1.2 Spandrel Panel Inserts: Composite metal faced flat panels having maximum 0.8% deviation in surface plane for total width and length as specified in Section 07 42 43.

2.7.1.3 Back Pan: Galvanized steel in accordance with ASTM A653/A653M, 0.91 mm base metal thickness, formed into a pan shape with back of pan flush with inside face of back section.

2.7.1.4 Insulation: Rigid mineral fibre insulation held in place with manufacturer’s standard fixing system to back face of back pan.

2.7.2 Perimeter Fire Stopping Systems: Specified in Section 07 84 00.

2.7.3 Insulating Materials: Semi-rigid insulation as specified in Section 07 21 13.13

2.7.4 Bituminous Paint: Cold applied asphalt mastic paint in accordance with SSPC-Paint 12 requirements except containing no asbestos, formulated for 0.76 mm thickness per coat.

2.7.5 Custom decorative metal fins: As indicated in Section 05 75 00 – Decorative Formed Metal

2.8 FABRICATION

2.8.1 Form aluminum shapes before finishing.

2.8.2 Fabricate components that have the following characteristics when assembled:

2.8.2.1 Sharp profiles, straight and free of defects or deformations.

2.8.2.2 Accurately fitted joints with ends coped or mitred.

2.8.2.3 Internal guttering systems or other means to drain water passing joints, condensation occurring within framing members, and moisture migrating within the system to exterior.

2.8.2.4 Physical and thermal isolation of glazing from framing members.
2.8.2.5 Accommodations for thermal and mechanical movements of glazing and framing to prevent glazing-to-glazing contact and to maintain required glazing edge clearances.

2.8.2.6 Provisions for re-glazing.

2.8.3 Weld in concealed locations to greatest extent possible to minimize distortion or discoloration of finish; remove weld spatter and welding oxides from exposed

2.8.4 Factory Assembled Unitized Frame Units:

2.8.4.1 Rigidly secure non-movement joints.

2.8.4.2 Seal joints watertight, except where manufacturer’s standard details indicate a requirement for open joints.

2.8.4.3 Pressure equalize system at its interior face.

2.8.4.4 Install glass units in accordance with Manufacturer’s recommended glazing procedures.

2.8.5 Clearly mark fabricated components to identify their locations in accordance with Shop Drawings.

2.9 ALUMINUM FINISHES

2.9.1 Finish designations prefixed by AA comply with the system established by the Aluminum Association for designating aluminum finishes.

2.9.2 High Performance Organic Finish:

2.9.2.1 Interior: 2 Coat PVDF Coating: AA-C12 Chemical Finish, cleaned with inhibited chemicals; C40 Chemical Finish, conversion coating; R1x Organic Coating, manufacturer's standard 2 coat, thermo-cured system consisting of specially formulated inhibitive primer and fluoropolymer colour topcoat containing not less than 70% PVDF resin by weight; prepare, pre-treat, and apply coating to exposed metal surfaces in accordance with AAMA 2604 and with coating and resin manufacturers' written instructions.

2.9.2.1.1 Colour: “Bright White – UC55026”

2.9.2.1.2 Basis-of-Design Materials: PPG Duranar.

2.9.2.2 Interior: 2 Coat PVDF Coating: AA-C12 Chemical Finish, cleaned with inhibited chemicals; C40 Chemical Finish, conversion coating; R1x Organic Coating, manufacturer's standard 2 coat, thermo-cured system consisting of specially formulated inhibitive primer and fluoropolymer colour topcoat containing not less than 70% PVDF resin by weight; prepare, pre-treat, and apply coating to exposed metal surfaces in accordance with AAMA 2604 and with coating and resin manufacturers' written instructions.

2.9.2.2.1 Colour: Custom colour to match “Pewter – UC7019F”

2.9.2.2.2 Basis-of-Design Materials: PPG Duranar.

2.9.2.3 Exterior: 3 Coat PVDF Coating: AA-C12 Chemical Finish, cleaned with inhibited chemicals; C40 Chemical Finish, conversion coating; R1x Organic Coating, manufacturer's standard 3 coat, thermo-cured system consisting of specially formulated inhibitive primer, fluoropolymer colour coat, and clear fluoropolymer topcoat, with both colour coat and clear topcoat containing not less than 70% PVDF resin by weight; prepare, pre-treat, and apply coating to exposed metal surfaces in accordance with AAMA 2605 and with coating and resin manufacturers' written instructions.
2.9.2.3.1 Colour: standard color match to Alpolic-Panel “MT-1a”
   “Metallic – 739L846 (FEVE) Valfron 10725 Metallic 730L002 clearcoat
2.9.2.3.2 Basis-of-Design Materials: PPG Duranar XL.

3 Execution

3.1 EXAMINATION

3.1.1 Verification of Conditions: Verify that conditions of substrates installed by other
Sections are acceptable for curtain wall installation in accordance with
manufacturer's written instructions:

3.1.1.1 Verify dimensions, tolerances, and method of attachment with other
work.

3.1.1.2 Verify wall openings and adjoining building envelope components and
materials are ready to receive work of this Section.

3.1.1.3 Inform Consultant and Construction Manager of unacceptable
conditions immediately upon discovery.

3.1.1.4 Proceed with installation only after unacceptable conditions have been
corrected.

3.2 INSTALLATION

3.2.1 Install in accordance with manufacturer's written instructions and as follows:

3.2.1.1 Install components free from damage or irregularities.

3.2.1.2 Fit joints to produce hairline joints free of burrs and distortion.

3.2.1.3 Rigidly secure non-movement joints.

3.2.1.4 Install anchors with separators and isolators to prevent metal corrosion
and electrolytic deterioration and to prevent impeding movement of
moving joints.

3.2.1.5 Weld components in concealed locations to minimize distortion or
discoloration of finish; protect glazing surfaces from welding; protect
work of other sections from welding.

3.2.1.6 Seal internal non-rain-screen joints watertight, except where
manufacturer’s standard details indicate a requirement for open joints.

3.2.2 Metal Protection:

3.2.2.1 Protect aluminum that contacts dissimilar metals against galvanic
action by painting contact surfaces with primer, by applying sealant or
tape, or installing nonconductive spacers.

3.2.2.2 Protect aluminum that contacts concrete or masonry against corrosion
by painting contact surfaces with bituminous paint.

3.2.3 Install components to drain water passing joints, condensation occurring within
framing members, and moisture migrating within the system to exterior.

3.2.4 Install components plumb and true in alignment with established lines and
grades.

3.2.5 Install glass in accordance with manufacturer’s standard glazing
recommendations using materials described in Section 08 81 00.

3.2.6 Install sealants in accordance with Section 07 92 00.

3.2.7 Install insulation materials in accordance with manufacturer’s standard practices.

3.2.8 Install perimeter fire containment systems as specified in Section 07 84 00.
3.2.9 Erection Tolerances: Install glazed aluminum curtain wall systems in accordance with the following maximum tolerances:

3.2.9.1 Plumb: 3 mm in 3000 mm; 6 mm in 12 m cumulative.
3.2.9.2 Level: 3 mm in 6000 mm; 6 mm in 12 m cumulative.

3.2.9.3 Alignment: Limit offsets from true alignment as follows:

3.2.9.3.1 1.5 mm where surfaces abut in line or are separated by reveal or protruding element up to 13 mm wide.
3.2.9.3.2 3 mm where surfaces are separated by reveal or protruding element from 13 mm to 25 mm wide.
3.2.9.3.3 6 mm where surfaces are separated by reveal or protruding element of 25 mm wide or greater.

3.2.9.4 Location: Limit variation from plane to 3 mm in 3600 mm; 13 mm over total length.

3.2.10 Attach curtain wall system to supporting structures to permit sufficient adjustment to accommodate construction tolerances and other irregularities:

3.2.10.1 Use alignment attachments and shims that permanently fasten system to building structure.
3.2.10.2 Clean weld surfaces; apply protective primer to site welds and adjacent surfaces.

3.2.11 Align assembly plumb and level, free of warp or twist; maintain assembly dimensional tolerances and align with adjacent work, and as follows:

3.2.11.1 Use thermal isolation where components penetrate or disrupt building insulation.
3.2.11.2 Install flashings and closures.
3.2.11.3 Coordinate installation of fire stop insulation, specified in Section 07 84 00, at each floor slab edge and intersection with vertical construction and install fire safing materials.
3.2.11.4 Coordinate attachment and seal of perimeter building envelope transition materials.
3.2.11.5 Install insulation in shim spaces at perimeter of assembly to maintain continuity of thermal barrier.

3.3 MANUFACTURER’S FIELD SERVICES

3.3.1 Curtain wall product manufacturer to provide field surveillance of the installation of their Products.

3.3.2 Monitor and report installation procedures, and unacceptable conditions to Construction Manager and Consultant.

3.4 SITE QUALITY CONTROL

3.4.1 Testing Agency: Owner will engage a qualified independent inspection and testing agency to perform site tests and inspections and prepare test reports:

3.4.1.1 Tests and inspections of representative areas will determine compliance of installed systems with specified requirements and in successive stages throughout installation as directed by Consultant.
3.4.1.2 Do not proceed with installation of the next area until test results for previously completed areas show compliance with requirements.

3.4.2 Structural Sealant Compatibility and Adhesion: Test structural in accordance with recommendations of ASTM C 1401 and as follows:

3.4.2.1 Destructive test method, Method A, Hand Pull Tab (Destructive) in ASTM C1401, Appendix X2 shall be used:
3.4.2.1.1 A minimum of four areas on each building face shall be tested.
3.4.2.1.2 Repair installation areas damaged by testing.

3.4.3 Air Infiltration: Areas shall be smoke tested for air leakage.

3.4.4 Structural Sealant Glazing Inspection: Inspect structural sealant glazing and evaluate in accordance with ASTM C1401 recommendations after installation of aluminum framed entrance and storefront systems is complete.

3.4.5 Repair or remove work where test results and inspections indicate that it does not comply with specified requirements.

3.4.6 Additional inspection and testing, at Trade Contractor’s expense, will be performed to determine compliance of replaced or additional work with specified requirements.

3.5 ADJUSTING

3.5.1 Adjust operating hardware for smooth operation in accordance with hardware manufacturers’ written instructions.

3.5.2 Adjust closers designated as accessible for people with disabilities to provide a 3 second closer sweep period for doors to move from a 70° open position to 75 mm from latch measured to the leading door edge.

3.6 PROTECTION

3.6.1 Protect aluminum finishes and glazing during erection against disfiguration, contamination or damage by abuse or harmful materials.

3.6.2 Install protective cover where exposure to damage is critical.

3.6.3 Mark each light with large cross or other symbol to make glass obvious and noticeable to other trades after glass is installed, using substance that will not stain, mark or “shadow” glass either by itself or by reaction with sunlight, moisture or the environment; masking tape is not considered as a suitable material; replace glass units marked with masking tape.

END OF SECTION
1 General

1.1 SUMMARY

1.1.1 This Section includes requirements for supply and installation of structural sealant glazed aluminum framed skylights with retaining caps consisting of the following:

1.1.1.1 Fixed, low iron low emissivity (Low E) sealed glass units
1.1.1.2 Delegated design of anchorages, fasteners and metal fabrications required to attach skylight to supporting structures.
1.1.1.3 Other manufacturer’s components required for a complete and functional skylight installation.

1.2 RELATED REQUIREMENTS

1.2.1 Section 01 33 50 – Delegated Design Submittals
1.2.2 Section 05 75 00 – Decorative Formed Metal: Custom decorative metal fins
1.2.3 Section 06 10 53 – Miscellaneous Rough Carpentry
1.2.4 Section 07 21 13.13 – Semi-Rigid Board Insulation: Site installed insulation materials in conjunction with metal framed skylights.
1.2.5 Section 07 52 23 – Cold Adhesive Applied Modified Bituminous Membrane Roofing
1.2.6 Section 07 92 00 – Joint Sealants: Sealants installed with metal framed skylights.
1.2.7 Section 08 44 13 – Glazed Aluminum Curtain Walls: Curtain wall systems installed with metal framed skylights.
1.2.8 Section 08 81 00 – Glass Glazing: glazed units installed in metal-framed skylights.

1.3 DEFINITIONS

1.3.1 Delegated Design Professional Engineer: The professional engineer hired or contracted to the fabricator or manufacturer to produce delegated design submittals and shop drawings to meet the requirements of the Project, and registered in the province of the Work, and who is not the Consultant.

1.3.2 Equal Dimensions: Skylight assemblies indicating equal dimensions on the drawings shall be calculated to align with in-place structural elements followed by even division of the space between structural elements. This shall mean that skylight materials are evenly spaced between adjacent structural members, not necessarily evenly spaced across the entire assembly.

1.4 REFERENCE STANDARDS

1.4.1 Aluminum Association (AA):

1.4.1.1 Aluminum Design Manual, 2010

1.4.2 American Architectural Manufacturer’s Association (AAMA):

1.4.2.1 AAMA 1503-09, Voluntary Test Method for Thermal Transmittance and Condensation Resistance of Windows, Doors and Glazed Wall Sections
1.4.2.2 AAMA 2604-10, Voluntary Specification, Performance Requirements and Test Procedures for High Performance Organic Coating on Aluminum Extrusions and Panels
1.4.2.3 AAMA SDGS-1-89, Structural Design Guidelines for Aluminum Framed Skylights
1.4.2.4 AAMA RPC-00, Rain Penetration Control: Applying Current Knowledge
1.4.3 American Society for Testing and Materials (ASTM):
   1.4.3.1 ASTM A123/A123M-13, Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products
   1.4.3.2 ASTM A653/A653M-11, Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process
   1.4.3.3 ASTM A167-99 (R2004), Stainless and Heat-Resisting Chromium-Nickel Steel Plate, Sheet and Strip
   1.4.3.4 ASTM B209/209M-04, Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate
   1.4.3.5 ASTM B221-13, Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes
   1.4.3.6 ASTM B308/B308M-10, Standard Specification for Aluminum-Alloy 6061-T6 Standard Structural Profiles
   1.4.3.7 ASTM B429-02, Standard Specification for Aluminum-Alloy Extruded Structural Pipe and Tube
   1.4.3.8 ASTM C920-11, Standard Specification for Elastomeric Joint Sealants
   1.4.3.9 ASTM C1135-00(2011), Standard Test Method for Determining Tensile Adhesion Properties of Structural Sealants
   1.4.3.10 ASTM C1184-14, Standard Specification for Structural Silicone Sealants
   1.4.3.11 ASTM C1401-14, Standard Guide for Structural Sealant Glazing
   1.4.3.12 ASTM E283-04, Standard Test Method for Determining the Rate of Air Leakage Through Exterior Windows, Curtain Walls, and Doors Under Specified Pressure Differences Across the Specimen
   1.4.3.14 ASTM E331-00, Standard Test Method for Water Penetration of Exterior Windows, Skylights, Doors, and Curtain Walls by Uniform Static Air Pressure Difference
   1.4.3.15 ASTM E783-02(2010), Standard Test Method for Field Measurement of Air Leakage Through Installed Exterior Windows and Doors
   1.4.3.16 ASTM E1105-00(2008), Standard Test Method for Field Determination of Water Penetration of Installed Exterior Windows, Sky

1.4.4 Canadian Standards Association (CSA):
   1.4.4.1 CSA G40.20-13/G40.21-13, General Requirements for Rolled or Welded Structural Quality Steel Structural Quality Steel
   1.4.4.2 CSA W47.1-09, Certification of Companies for Fusion Welding of Steel
   1.4.4.3 CSA W47.2-11, Certification of Companies for Fusion Welding of Aluminum
   1.4.4.4 CSA W59-03, Welded Steel Construction (Metal Arc Welding), Metric
   1.4.4.5 CSA W59.2-1991 (R2003), Welded Aluminum Construction

1.4.5 Canadian Welding Bureau (CWB Group Industry Services):
   1.4.5.1 CWB 112E, 93-1, Welding Symbols Study Guide
   1.4.5.2 CWB 113E, 94-1, Weld Quality and Examination Methods Study Guide

1.4.6 National Fenestration Rating Council (NFRC):
   1.4.6.1 NFRC 100-2010 Procedure for Determining Fenestration Product U-Values

1.4.7 The Society for Protective Coatings (SSPC)/National Association of Corrosion Engineers (NACE International):
1.4.7.1 Surface Preparation Guidelines:
1.4.7.1.1 SSPC-SP COM Surface Preparation Commentary for Steel and Concrete Substrates
1.4.7.1.2 SSPC-PS Guide 12.00, Guide to Zinc-Rich Coating Systems

1.4.8 Underwriters Laboratories of Canada (ULC):
1.4.8.1 CAN/ULC S702-97, Standard for Mineral Fibre Thermal Insulation for Buildings

1.5 ADMINISTRATIVE REQUIREMENTS

1.5.1 Pre-Construction Meeting: Conduct a pre-construction meeting in accordance with Section 01 31 19 – Project Meetings attended by Construction Manager, Subcontractor, Consultant and other Subcontractor’s affected by work of this Section on site to verify project requirements, and review methods and procedures related to skylights including the following:
1.5.1.1 Review structural load limitations and deflection criteria of adjacent construction, support systems and skylight.
1.5.1.2 Review installation and substrate and structure conditions affecting work of this Section.
1.5.1.3 Review skylight curb structural requirements.
1.5.1.4 Review and finalize construction schedule and verify availability of materials, Installer's personnel, equipment, and facilities needed to make progress and avoid delays.
1.5.1.5 Review written installation instructions and warranty requirements.
1.5.1.6 Review other or additional installation requirements not otherwise covered by the suggested listing of topics.

1.5.2 Coordination: Coordinate installation of curtain wall system with work specified in other Sections to ensure correct placement and installation of vapour barrier, insulation and flashing to maintain continuity of building air, vapour and thermal barrier and to divert moisture and water to the exterior, and as follows:
1.5.2.1 Coordinate installation of sealants so that ambient and surface temperatures are greater than 5°C from time of application until sealants have cured.
1.5.2.2 Coordinate design of skylight elements to tie into adjacent building envelope elements.
1.5.2.3 Coordinate fabrication of miscellaneous steel, anchorages and fasteners required by skylight for complete installation.
1.5.2.4 Coordinate work of this Section with structural silicone adhered glazing applications; sealant manufacturer’s technical service representative must review installation conditions before starting fabrication or installation; submit an engineered and certified installation report prior to construction for review.

1.6 SUBMITTALS

1.6.1 Provide required information in accordance with Section 01 33 00 – Submittal Procedures.

1.6.2 Action Submittals: Provide the following submittals before starting any work of this Section:
1.6.2.1 Product Data: Submit product data indicating construction details, material descriptions, dimensions and profiles of components, and finishes for metal-framed skylights, in addition to the following specific requirements:
1.6.2.1.1 Mechanical Fasteners: Indicate sizes, shear, and pull over loading capacity where applicable.
1.6.2.1.2 Corrosion Protection: Indicate thickness and type of corrosion protection coating.

1.6.2.2 Shop Drawings: Submit shop drawings prepared by or under the supervision of a qualified professional engineer detailing fabrication and assembly of skylight indicating construction details including the following:

- Connections and anchor requirements.
- Metal fabrications integral with skylight installation.
- Type, size and spacing of fastening devices.
- Design loads.
- Connections to adjacent air and vapour membranes.
- Internal drainage and sealant locations.
- Seal of a professional engineer registered in the Province of the Work for details requiring structural design for load bearing, or life and health safety.
- Other detailed requirements for installation.

1.6.2.3 Samples for Verification: Submit samples for each type of exposed finish required, in 300 mm long sections for Consultant’s verification of specified finishes including the following:

- Primary members
- Joinery
- Anchorage
- Expansion provisions
- Glazing
- Flashing and drainage

1.6.3 Information Submittals: Provide the following submittals during the course of the Work:

1.6.3.1 Source Quality Control Submittals: Submit delegated design professional engineer’s design notes and calculations when requested by Consultant.

1.6.3.2 Manufacturer’s Installation Instructions: Submit manufacturer’s installation instructions for transition membrane assembly when requested by Consultant.

1.6.3.3 Delegated Design Submittals: Submit letters of commitment and compliance in accordance with Section 01 33 50 – Delegated Design Submittals as follows:

- Provide Letter of Commitment in conjunction with shop drawings, signed and sealed by the professional engineer required by the Work of this Section indicating the following are designed to the intent of the Building Code:
  - Skylight connections to building structure
  - Skylight deflection connections to building structure
  - Skylight reinforcement
  - Deflection of members
  - Glass thickness as they relate to glass area and applied horizontal loads

- Provide Letter of Compliance, signed and sealed by the professional engineer required by the Work of this Section indicating that connections, reinforcement and deflection criteria, and glass thickness of installed system is in compliance with the intent of the Building Code and reviewed shop drawings before declaration of Substantial Performance.
1.6.3.4 Sealant Compatibility and Adhesion Test Reports: From sealant manufacturer indicating that materials forming joint substrates and joint sealant backings have been tested for compatibility and adhesion with sealants; include sealant manufacturer's interpretation of test results for sealant performance and recommendations for primers and substrate preparation needed for adhesion.

1.6.4 Sustainable Design Submittals: Coordinate project sustainable design requirements with Section 01 35 31 - LEED Special Project Procedures and Section 01 35 31A - LEED Material Information Sheet for LEED Submittals, including the following:

1.6.4.1 A Design Service Life (DSL) of 50 years has been selected for the New Central Library. Submit a letter from the manufacturer confirming that the metal panels will have a Predicted Service Life (PSL) of at least half of the life of the building.

1.7 PROJECT CLOSEOUT SUBMISSIONS

1.7.1 Submit data for cleaning of aluminum finishes and maintenance of structural silicone glazing system and operational hardware in accordance with Section 01 78 23 – Operations and Maintenance Data.

1.8 QUALITY ASSURANCE

1.8.1 Qualifications: Provide proof of qualifications during the course of the Work of this Section:

1.8.1.1 Installer: Installer shall be capable of assuming delegated design engineering responsibility, performing Work of this Section and who is acceptable to manufacturer for the type of work specified, and as follows:

1.8.1.1.1 Engineering Responsibility: Preparation of Shop Drawings, testing program development, test result interpretation, and comprehensive engineering analysis by a qualified professional engineer.

1.8.1.1.2 Engineering Responsibility: Preparation of data for metal-framed skylights, including Shop Drawings, based on engineering analysis of manufacturer's standard skylights similar to those indicated for this Project.

1.8.1.1.3 Welding: Qualify procedures and personnel according to AWS D1.2, "Structural Welding Code--Aluminum."

1.8.1.2 Delegated Design Professional: Retain a Professional Engineer, registered in the Province of the Work, to design fabrication and erection of the Work of this Section in accordance with applicable Building Code and Contract Documents requirements including the following:

1.8.1.2.1 Seal and signature to shop drawings and design submittals
1.8.1.2.2 Site review of installed components
1.8.1.2.3 Submittal of required letters of commitment and compliance

1.8.2 Certifications: Provide the following during the course of the Work:

1.8.2.1 Compliance Certification: Provide certificates from manufacturer indicating tested performance requirements required by Authorities Having Jurisdiction.
1.8.2.2 Letters of Commitment and Compliance: Provide documents prepared by the delegated design professional engineer as recommended by APEGA’s Responsibilities for Engineering Services for Building Projects in accordance with Section 01 33 50 – Delegated Design Submittals.

1.9 MOCK-UPS

1.9.1 Provide Mock-Ups in accordance with Section 01 45 00 – Quality Control: to demonstrate aesthetic effects and set quality standards for fabrication and installation as follows:

1.9.1.1 Build mock-ups in the location and of the size indicated or, if not indicated, as directed by Consultant.
1.9.1.2 Notify Consultant seven (7) days in advance of dates and times when mock-ups will be constructed.
1.9.1.3 Demonstrate the proposed range of aesthetic effects and workmanship.
1.9.1.4 Obtain Consultant's approval of mock-ups before starting fabrication.
1.9.1.5 Maintain mock-ups during construction in an undisturbed condition as a standard for judging the completed Work.
1.9.1.6 Demolish and remove mock-ups when directed.
1.9.1.7 Acceptable mock-ups may form a part of the completed Work if undisturbed at time of Substantial Performance.

1.10 DELIVERY, STORAGE AND HANDLING

1.10.1 Delivery and Acceptance Requirements: Deliver, handle and store prefabricated units in accordance with manufacturer’s directions.

1.10.2 Storage and Handling Requirements: Store units at site on raised wood pallets protected from the elements and corrosive materials, and as follows:

1.10.2.1 Do not remove from crates or other protective covering until ready for installation.
1.10.2.2 Store all glass units vertically on end with solid bearing full thickness of sealed units.
1.10.2.3 Store pre-fabricated frame assemblies blocked off the ground to prevent warping, twisting, undue strain on assembly or physical abuse and damage.

1.11 SITE CONDITIONS

1.11.1 Site Measurements: Verify dimensions of other construction by site measurements before fabrication and indicate measurements on shop drawings where aluminum curtain wall systems are indicated to fit to other construction.

1.11.2 Established Dimensions: Establish dimensions and proceed with fabricating aluminum curtain wall without site measurements where site measurements cannot be made without delaying the Work, coordinated with other construction to ensure that actual dimensions correspond to established dimensions.

1.11.3 Ambient Conditions: Confirm installation requirements for ambient and surface temperatures of sealants with manufacturer and apply sealants when temperatures are greater than manufacturer’s stated minimum from time of application until sealants have cured.

1.12 WARRANTY

1.12.1 General Warranty: Special warranty specified in this Article shall not deprive Owner of other rights Owner may have under other provisions of the Contract Documents and shall be in addition to, and run concurrent with, other warranties made by Contractor under requirements of the Contract Documents.
1.12.2 Special Assembly Warranty: Provide manufacturer’s written warranty, signed and issued in the name of Owner stating that they agree to repair or replace the following items for defective material and workmanship for the time stated from date of Substantial Performance:

1.12.2.1 Structural failures resulting from excessive deflection.
1.12.2.2 Noise or vibration caused by thermal movements.
1.12.2.3 Deterioration of metals, metal finishes and other materials beyond normal weathering.
1.12.2.4 Adhesive of cohesive sealant failures, and failure to maintain a seal.
1.12.2.5 Water leakage through fixed glazing and framing areas.
1.12.2.6 Failure of operating components to function properly.
1.12.2.7 Warranty Term: Five (5) years.

1.12.3 Special Glass Warranty: Provide manufacturer’s written warranty, signed and issued in the name of Owner stating that they will replace sealed glass units that exhibit misting, dusting and seal failures as indicated in Section 08 81 00 – Glass Glazing.

1.12.4 Special Finish Warranty: Provide manufacturer’s written coating warranty stating that they agree to repair or replace components on which finishes fail within twenty (20) years from date of Substantial Performance and that are not attributable to normal weathering.

2 Products

2.1 MANUFACTURERS

2.1.1 Basis-of-Design Materials: Products named in this Section were used as the basis-of-design for the project; manufacturers listed as additional acceptable materials 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.

2.1.1.1 Basis-of-Design Material: Ferguson Glass Western Ltd. (Engineered Aluminum Products Inc. (EAP))

2.2 PERFORMANCE REQUIREMENTS

2.2.1 Coordinate delegated design requirements with Section 01 33 50 – Delegated Design Submittals.

2.2.2 Retain a professional engineer registered in province of Work, experienced in structural design in glass and aluminum to design skylight units, structural silicone glazing system and connections; to ensure the adequacy of the structural aspects of the design, manufacture, and installation of complete assembly; this engineer is called the "delegated design professional engineer" as defined in item 1.3.1 above.

2.2.3 Design skylight capable of withstanding design loads within limits and under design loads indicated in this Section, and as follows:

2.2.3.1 Dead Loads: Account for weights of materials and construction accessories.

2.2.3.2 Structural Loads:

2.2.3.2.1 Wind Loads: 0.50 kPa 1/50 year occurrence in accordance with the Building Code.
2.2.3.2.2 Snow Loads: As indicated.
2.2.3.2.3 Roof Loads: As follows:

- Concentrated Load: 1112 N applied to framing members at location that produces the most severe stress or deflection.
• Live Load: As indicated.
• Rain Load: As indicated.

2.2.3.2.4 Seismic Loads: As follows:
• Acceleration Zone: 0
• Velocity Zone: 1
• Zonal Velocity Ratio: 0.05
• R-Factor: 1.5
• Importance Factor: 1.0

2.2.3.2.5 Intermittent Stabilization Anchor Loads, as follows:
• Anchors able to withstand 2.67 kN (600 lbs) ultimate pull in any direction (non-simultaneous loading).

2.2.3.2.6 Structural Performance: Provide metal-framed skylights, including anchorage, capable of withstanding test pressure indicated without material and deflection failures and permanent deformation of structural members exceeding 0.2 percent of span when tested according to ASTM E 330.
• Test Pressure: 150 percent of positive and negative wind-load design pressures.
• Test Duration: As required by design wind velocity; fastest 1.609 km of wind for relevant exposure category.

2.2.3.2.7 Other Design Loads and Conditions: Design system components to accommodate the following without damage to components or deterioration of seals:
• Movement within system
• Movement between system and perimeter framing components
• Dynamic loading and release of loads
• Deflection of structural support framing

2.2.4 Deflection Limits:

2.2.4.1 Deflection of the entire length of framing members in direction normal to glazing plane is limited to 1/180 of clear span or 19 mm, whichever is smaller, unless otherwise indicated.

2.2.4.2 Deflection of the entire length of framing members for spans exceeding 6 m is limited to 1/240 of clear span.

2.2.4.3 Deflection Parallel to Glazing Plane: Limited to amount not exceeding an amount that reduces glazing bite to less than 75% of design dimension and that reduces edge clearance between framing members and glazing or other fixed components to less than 3 mm.

2.2.5 Performance Requirements: Design, engineer, test, fabricate, deliver, install and guaranty construction necessary to provide and install skylight and structural silicone adhered glazing systems including anchorage capable of withstanding without failure, the effects of the following:

2.2.5.1 Structural loads listed above.
2.2.5.2 Environmental movements and performance criteria listed below.
2.2.5.3 Movements of supporting structure indicated on Drawings including story drift, twist, column shortening, long-term creep, and deflection from uniformly distributed and concentrated live loads.
2.2.5.4 Dimensional tolerances of building frame and other adjacent construction.
2.2.5.5 Failure of the system will be considered as:
2.2.5.5.1 Deflection exceeding specified limits.
2.2.5.5.2 Thermal stresses transferred to building structure.
2.2.5.5.3 Framing members transferring stresses, including those caused by thermal and structural movements, to glazing.
2.2.5.5.4 Noise or vibration created by wind and thermal and structural movements.
2.2.5.5.5 Loosening or weakening of fasteners, attachments, and other components.
2.2.5.5.6 Sealant failure.

2.2.6 Environmental Conditions: Design curtain wall systems to account for the following environmental conditions:

2.2.6.1 Thermal Movements: Allow for thermal movements resulting from the following maximum change (range) in ambient temperatures, accounting for surface temperatures of materials due to both solar heat gain and night time sky heat loss:

2.2.6.1.1 Temperature Change (Range):
- Exterior Ambient: -33°C to +29°C
- Interior Ambient: +16°C to +29°C
- Adjust calculations to account for colour treatments or coatings on curtain wall framing members.

2.2.6.1.2 Allow for thermal movement with no buckling of frame members, stress on glass, glazing edge seal failure, sealant failure, excess stress on curtain wall framing, anchors and fasteners, or reduction of performance.

2.2.6.2 Condensation Index: Design thermal break to Cl to not less than 77₉ and 74 in accordance with CSA A440 on interior of window metal surfaces to not over 5% of area when conditions are:

2.2.6.2.1 Exterior Air Temperature: -32°C
2.2.6.2.2 Interior Air Temperature: 22°C ±1.2°C
2.2.6.2.3 Interior Relative Humidity (Winter): 15%
2.2.6.2.4 Interior Relative Humidity (Summer): 50-60%

2.2.6.3 Air Infiltration: Design system for maximum air leakage of 0.3 L/s m² of fixed wall area when tested in accordance with ASTM E283 at a minimum static air pressure differential of 300 Pa.

2.2.6.4 Water Penetration Under Static Pressure: Design system for zero water penetration when tested in accordance with ASTM E331 at a minimum differential static pressure of 20% of positive design wind load; but not less than 300 Pa.

2.2.6.5 Average Thermal Conductance: Combined glass and framing Design system having average insulation factor of not more than 1.36 W/m²•K when tested in accordance with AAMA 1503 using high performance glass specified in Section 08 81 00.

2.3 FRAMING MATERIALS

2.3.1 Aluminum: Materials recommended by manufacturer for type of use and finish indicated, and as follows:

2.3.1.1 Sheet and Plate: In accordance with ASTM B209/B209M, and ANSI H35.1 AA1100-H14, or AA5005-H32 or H34, anodizing quality.
2.3.1.2 Extruded Bars, Rods, Profiles, and Tubes: In accordance with ASTM B221), and ANSI H35.1 AA6063-T5 or T6, anodizing quality.
2.3.1.3 Extruded Structural Pipe and Tubes: In accordance with ASTM B429, and ANSI H35.1 AA6061-T6 or AA6063-T6, anodizing quality.
2.3.1.4 Structural Profiles: In accordance with ASTM B308/B308M, anodizing quality.
2.3.1.5 Welding Rods and Bare Electrodes: CSA W59.2.

2.3.2 Brackets and Reinforcements: Manufacturer's standard high strength aluminum with non-staining, nonferrous shims for aligning system components.

2.3.3 Fasteners and Accessories: Manufacturer's standard corrosion-resistant, non-staining, non-bleeding fasteners and accessories compatible with adjacent materials.

2.3.3.1 Use self locking devices where fasteners are subject to loosening or turn out from thermal and structural movements, wind loads, or vibration.

2.3.3.2 Reinforce members to receive fastener threads.

2.3.3.3 Use only concealed fasteners, unless use of exposed fasteners has been accepted in writing by the Consultant.

2.3.3.4 Finish exposed portions to match framing system.

2.3.3.5 Use slip joint linings, spacers, and sleeves at movement joints of material and type recommended by manufacturer.

2.3.4 Anchors: Three way adjustable anchors that accommodate fabrication and installation tolerances in material and finish compatible with adjoining materials and recommended by manufacturer.

2.3.5 Concealed Flashing: Manufacturer's standard corrosion-resistant, non-staining non-bleeding flashing; compatible with adjacent materials.

2.3.6 Transition Membranes: Full length self adhering SBS modified bitumen reinforced membrane; having low temperature formulation appropriate for installation requirements and compatible with materials specified in Section 07 25 13.

2.3.7 Glazing Gaskets: Manufacturer's standard sealed corner pressure glazing system of black, resilient elastomeric glazing gaskets, setting blocks, and shims or spacers; as recommended by manufacturer for joint type.

2.4 FRAMING SYSTEM

2.4.1 Frame Type: To profiles indicated on drawings, of suitable alloy and proper temper for extruding and adequate structural characteristics, suitable for finishing as specified and as follows:

2.4.1.1 Glazing throat length to suit thickness of sealed glass unit.

2.4.1.2 Basis-of-Design Material: Engineered Aluminum Products Inc. (EAP), 4S700 Series

2.5 GLAZING MATERIALS

2.5.1 Insulating Glass: Refer to Section 08 81 00.

2.5.2 Glazing Gaskets: Manufacturer's standard sealed corner pressure glazing system of black, resilient elastomeric glazing gaskets, setting blocks, and shims or spacers.

2.5.3 Standard Glazing Sealants: As recommended by manufacturer for joint type with materials used on interior side of vapour barrier having a maximum VOC limit of 250 g/L in accordance with SCAQMD Rule 1168.

2.5.4 SSG System Glazing Sealants: As recommended by manufacturer for joint type and as follows:

2.5.4.1 Structural Sealant: Structural silicone based on Type S-4 as specified in Section 07 92 00, compatible with other glazing materials specified in Section 08 81 00; and as follows:

2.5.4.1.1 Type: Manufacturer's standard single or two component neutral curing silicone formulation meeting requirements of ASTM C1184.
2.5.4.1.2 Modulus of Elasticity: As required by structural sealant glazed curtain wall system design to meet performance requirements.

2.5.4.1.3 Tensile Adhesion: Minimum tensile strength: 690 kPa when tested in accordance with ASTM C1135, specifically formulated for use as structural sealant, and approved by structural sealant manufacturer for use in specified curtain wall systems.

2.5.4.1.4 Colour: Black.

2.5.4.1.5 Structural silicone sealants shall be designed and certified by manufacturer’s engineer.

2.6 ACCESSORIES

2.6.1 Wood Blocking: As indicated in Section 06 10 53.

2.6.2 Insulating Materials: Specified in Section 07 21 13.

2.6.3 Bituminous Paint: Cold applied asphalt mastic paint in accordance with SSPC-Paint 12 requirements except containing no asbestos, formulated for 0.76 mm thickness per coat.

2.6.4 Continuous profile connection for baffles as indicated in Section 09 84 00.

2.6.5 Structural Steel Framing: Custom Finish to match ‘Bright White – UC55026’ as indicated in Section 09 91 00.

2.7 FABRICATION

2.7.1 Framing Components: As follows:

2.7.1.1 Fabricate components that, when assembled, will have accurately fitted joints with ends coped or mitered to produce hairline joints free of burrs and distortion.

2.7.1.2 Fabricate components to drain water passing joints and to drain condensation and moisture occurring or migrating within skylight system to the exterior.

2.7.1.3 Fabricate components to accommodate expansion, contraction, and site adjustment, and to provide for minimum clearance and shimming at skylight perimeter.

2.7.1.4 Fabricate components to ensure that glazing is thermally and physically isolated from framing members.

2.7.1.5 Form shapes with sharp profiles, straight and free of defects or deformations, before finishing.

2.7.1.6 Fit and assemble components to greatest extent practicable before finishing.

2.7.1.7 Fit and secure joints with screw and spline, internal reinforcement, or welding.

2.7.1.8 Reinforce members as required to retain fastener threads.

2.7.1.9 Where fasteners are exposed to view from interior, countersink bolt or screw heads and finish to match framing.

2.7.1.10 Weld components before finishing and in concealed locations to greatest extent practicable to minimize distortion.

2.7.1.11 Before shipping, shop assemble, mark, and disassemble components that cannot be permanently shop assembled.

2.7.2 Provide continuous aluminum curb with weatherproof expansion joints and locked and sealed or fully welded corners. Locate weep holes in the curb at each rafter connection to drain condensation.

2.7.3 Prepare framing to receive anchor and connection devices and fasteners.

2.7.4 Metal Protection: As follows:
2.7.4.1 Where aluminum will contact dissimilar metals, protect against galvanic action by painting contact surfaces with primer or by applying sealant or tape recommended by manufacturer for this purpose.

2.7.4.2 Where aluminum will contact concrete or masonry, protect against corrosion by painting contact surfaces with bituminous paint.

2.7.4.3 Where aluminum will contact pressure-treated wood, separate dissimilar materials by methods recommended by manufacturer.

2.8 ALUMINUM FINISHES

2.8.1 Finish designations prefixed by AA comply with the system established by the Aluminum Association for designating aluminum finishes.

2.8.2 High Performance Organic Finish:

2.8.2.1 Interior: 2 Coat PVDF Coating: AA-C12 Chemical Finish, cleaned with inhibited chemicals; C40 Chemical Finish, conversion coating; R1x Organic Coating, manufacturer's standard 2 coat, thermo-cured system consisting of specially formulated inhibitive primer and fluoropolymer colour topcoat containing not less than 70% PVDF resin by weight; prepare, pre-treat, and apply coating to exposed metal surfaces in accordance with AAMA 2604 and with coating and resin manufacturers' written instructions.

2.8.2.1.1 Colour: “Bright White – UC55026”

2.8.2.1.2 Basis-of-Design Materials: PPG Duranar.

3 Execution

3.1 EXAMINATION

3.1.1 Verification of Conditions: Verify that conditions of substrates installed by other Sections are acceptable for curtain wall installation in accordance with manufacturer's written instructions:

3.1.1.1 Verify dimensions, tolerances, and method of attachment with other work.

3.1.1.2 Verify wall openings and adjoining building envelope components and materials are ready to receive work of this Section.

3.1.1.3 Inform Consultant and Construction Manager of unacceptable conditions immediately upon discovery.

3.1.1.4 Proceed with installation only after unacceptable conditions have been corrected.

3.2 INSTALLATION

3.2.1 Install in accordance with manufacturer's written instructions and as follows:

3.2.1.1 Install components free from damage or irregularities.

3.2.1.2 Fit joints to produce hairline joints free of burrs and distortion.

3.2.1.3 Rigidly secure non-movement joints.

3.2.1.4 Install anchors with separators and isolators to prevent metal corrosion and electrolytic deterioration and to prevent impeding movement of moving joints.

3.2.1.5 Set continuous curbs and flashings in a full sealant bed, unless otherwise indicated. Comply with requirements in Section 06 10 53 and 07 92 00.

3.2.1.6 Seal internal non-rain-screen joints watertight, except where manufacturer’s standard details indicate a requirement for open joints.
3.2.2 Metal Protection:

3.2.2.1 Protect aluminum that contacts dissimilar metals against galvanic action by painting contact surfaces with primer, by applying sealant or tape, or installing nonconductive spacers.

3.2.2.2 Protect aluminum that contacts concrete or masonry against corrosion by painting contact surfaces with bituminous paint.

3.2.3 Erection Tolerances: Install skylight components true in plane, accurately aligned, and without warp or rack. Adjust framing to comply with the following tolerances:

3.2.3.1 Variation from Plane: Limit variation from plane or location shown to 3 mm in 3.0 m; 6 mm over total length.

3.2.3.2 Alignment: Where surfaces abut in line and at corners and where surfaces are separated by less than 76 mm, limit offset from true alignment to less than 0.80 mm; otherwise, limit offset from true alignment to 3.2 mm.

3.2.4 Install glass in accordance with manufacturer’s standard glazing recommendations using materials described in Section 08 81 00.

3.2.5 Install sealants in accordance with Section 07 92 00.

3.2.6 Install insulation materials in accordance with manufacturer’s standard practices.

3.2.7 Install perimeter fire containment systems as specified in Section 07 84 00.

3.3 SITE QUALITY CONTROL

3.3.1 Testing Agency: Owner will engage a qualified independent inspection and testing agency to perform site tests and inspections and prepare test reports:

3.3.1.1 Tests and inspections of representative areas will determine compliance of installed systems with specified requirements and in successive stages throughout installation as directed by Consultant.

3.3.1.2 Do not proceed with installation of the next area until test results for previously completed areas show compliance with requirements.

3.3.2 Structural Sealant Compatibility and Adhesion: Test structural in accordance with recommendations of ASTM C 1401 and as follows:

3.3.2.1 Destructive test method, Method A, Hand Pull Tab (Destructive) in ASTM C1401, Appendix X2 shall be used:

3.3.2.1.1 A minimum of two areas on each building face shall be tested.

3.3.2.1.2 Repair installation areas damaged by testing.

3.3.3 Structural Sealant Glazing Inspection: Inspect structural sealant glazing and evaluate in accordance with ASTM C1401 recommendations after installation of aluminum framed entrance and storefront systems is complete.

3.3.4 Air Infiltration: Areas shall be smoke tested for air leakage.

3.3.5 Repair or remove work where test results and inspections indicate that it does not comply with specified requirements.

3.3.6 Additional inspection and testing, at Trade Contractor’s expense, will be performed to determine compliance of replaced or additional work with specified requirements.

3.4 CLEANING

3.4.1 Clean skylights inside and outside, immediately after installation and after sealants have cured, according to manufacturer’s written recommendations.
3.4.1.1 Remove temporary protective coverings and strippable coatings from prefinished metal surfaces. Remove labels and markings from all components.

3.4.2 Remove excess sealant according to sealant manufacturer's written recommendations.

END OF SECTION
1 General

1.1 RELATED REQUIREMENTS

1.1.1 Section 07 92 00 – Joint Sealants.
1.1.2 Section 08 11 13 – Steel Doors and Frames
1.1.3 Section 08 44 13 – Glazed Aluminum Curtain Walls.
1.1.4 Section 08 63 00 – Metal-Framed Skylights.

1.2 DEFINITIONS

1.2.1 Delegated Design Professional Engineer: The professional engineer hired or contracted to the fabricator or manufacturer to design actual glass thicknesses and glass types, and to 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.

1.2.2 Letters of Commitment and Compliance: Documents prepared by the delegated design professional engineer as recommended by APEGA’s Responsibilities for Engineering Services for Building Projects.

1.3 REFERENCE STANDARDS

1.3.1 American Society for Testing and Materials (ASTM):

1.3.1.1 ASTM C1036-11e1, Standard Specification for Flat Glass.
1.3.1.2 ASTM C1048-12e1, Standard Specification for Heat-Strengthened and Fully Tempered Flat Glass.
1.3.1.3 ASTM C1172-09e1, Standard Specification for Laminated Architectural Flat Glass.
1.3.1.4 ASTM C1349-10, Standard Specification for Architectural Flat Glass Clad Polycarbonate.
1.3.1.5 ASTM C1376-10, Standard Specification for Pyrolytic and Vacuum Deposition Coatings on Flat Glass.
1.3.1.6 ASTM C1503-08(2013), Standard Specification for Silvered Flat Glass Mirror.
1.3.1.7 ASTM D1003-00, Standard Test Method for Haze and Luminous Transmittance of Transparent Plastics.
1.3.1.8 ASTM E330-02, Structural Performance for Exterior Windows, Curtain Wall and Doors by Uniform Static Air Pressure Difference.
1.3.1.9 ASTM E2190-10, Standard Specification for Insulating Glass Unit Performance and Evaluation.

1.3.2 Canadian General Standards Board (CGSB):

1.3.2.1 CAN/CGSB 12.1 M90, Tempered or Laminated Safety Glass.
1.3.2.2 CAN/CGSB-12.3-M91, Flat, Clear Float Glass.
1.3.2.3 CAN/CGSB 12.8-97, Insulating Glass Units.
1.3.2.4 CAN/CGSB 12.9 M91, Glass, Spandrel.
1.3.2.5 CAN/CGSB-12.13-M91, Glass, Patterned.
1.3.2.6 CAN/CGSB 19.2 M87, Glazing Compound, Non hardening, Modified Oil Type.
1.3.2.7 CAN/CGSB 12.20-M89, Structural Design of Glass for Buildings.

1.3.3 Consumer Products Safety Commission (CPSC):

1.3.3.1 16 CFR 1201, Safety Standard for Architectural Glazing Materials.

1.3.4 Glass Association of North America (GANA):

1.3.4.1 GANA Glazing Manual.
1.3.5 International Standards Organization (ISO):
   1.3.5.1 EN14179-1:2005, Glass in Building. Heat Soaked Thermally Toughened Soda Lime Silicate Safety Glass, Definition and Description.

1.4 ADMINISTRATION REQUIREMENTS

1.4.1 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:
   1.4.1.1 Do not install any glazing until all nearby welding is completed.
   1.4.1.2 Mark each light of glass as it is installed in a manner to make it visible and obvious to all persons.
   1.4.1.3 Do not use materials that may permanently mar, discolour or disfigure the glass.

1.4.2 Delegated Design Requirements: Coordinate design of glass thicknesses and composition in glass curtain wall in accordance with referenced standards and requirements of this Section; coordinate with Section 08 44 13 for edge of glass deflections based on frame limitations listed in the related requirement.

1.5 SUBMITTALS

1.5.1 Provide required information in accordance with Section 01 33 00 – Submittal Procedures.

1.5.2 Action Submittals: Provide the following submittals before starting any work of this Section:
   1.5.2.1 Product Data: Submit manufacturer’s technical data for each glazing material required, including installation and maintenance, and listing following properties for single and multiple glazings with comparison to specified materials:
      1.5.2.1.1 Summer and Winter U-Factors (U-Value).
      1.5.2.1.2 Visible Light Transmittance (Tvis).
      1.5.2.1.3 Specific Heat Gain Coefficient (SHGC).
      1.5.2.1.4 Shading Coefficient (SC).
   1.5.2.2 Samples for Initial Selection: Submit five (5)-75 mm x 125 mm samples of opaque spandrel glass having different tinted coatings ranging from light to dark coloured to allow Consultant to determine which finish provides the required appearance; provide clear glass and shadow box so that spandrel samples can be interchanged.
   1.5.2.3 Samples for Verification: Submit the following samples for each glass type specified for verification by Consultant of products supplied to the Project:
      1.5.2.3.1 Sealed Glass Units: Submit one fully triple glazed 300 mm x 300 mm sample; indicate which surface low-e coatings have been applied to; attach glass performance requirements to back side of unit.
      1.5.2.3.2 Spandrel Glass Units: Submit one fully triple glazed 300 mm x 300 mm sample using material selected from initial sample selection process; and for each additional spandrel type specified.
1.5.3 Informational Submittals: Provide the following submittals during the course of the work of this Section:

1.5.3.1 Certificates: Separate certification will not be required for glazing materials bearing manufacturer’s permanent label designating type and thickness of glass, provided labels represent a quality control program involving a recognized certification agency or independent testing laboratory acceptable to Authority Having Jurisdiction:

1.5.3.1.1 Heat Soak Treated Tempered Glass: Submit manufacturer’s written statement or certificate indicating that glass supplied to this project has been heat soak tested in accordance with EN 14179-1 to reduce the likelihood of spontaneous breakage as a result of nickel sulphide inclusions; heat soak test all structural tempered glass used for project and confirm that delivered materials meet requirements established in this section.

1.5.3.2 Delegated Design Submittals: Provide delegated design in accordance with Section 01 33 50 for design criteria described in this Section, and as follows:

1.5.3.2.1 Submit delegated design professional engineer’s design notes and calculations upon request of the Consultant.

1.5.3.2.2 Submit Letter of Commitment, signed and sealed by professional engineer responsible for work of this Section; professional engineer shall define applicable responsibilities in the completed Letter of Commitment and Letter of Compliance in compliance with the intent of the Building Code. Submit in conjunction with Shop drawings.

1.5.3.2.3 Submit Letter of Compliance, signed and sealed by professional engineer responsible for work of this Section design engineer to certify substantial compliance with the system design before to declaration of Substantial Performance for the project.

1.5.3.3 Source Quality Control Submittals: Submit product test listings from a qualified testing agency indicating fire rated glass complies with requirements, based on comprehensive testing of current product.

1.5.4 Sustainable Design Submittals: Coordinate project sustainable design requirements with Section 01 35 31 - LEED Special Project Procedures and Section 01 35 31A - LEED Material Information Sheet for LEED Submittals.

1.6 PROJECT CLOSEOUT SUBMITTALS

1.6.1 Operation and Maintenance Data: Submit maintenance brochures on the care and cleaning of Glass Glazing materials in accordance with Section 01 78 23 – Operations and Maintenance Data.

1.7 QUALITY ASSURANCE

1.7.1 Qualifications: Provide proof of qualifications when requested by Consultant:

1.7.1.1 Installer: Use installers having experience with projects of similar scope and complexity, and approved for installing products by glass manufacturer.

1.7.1.2 Delegated Design Professional: Manufacturer’s engineering recommendations where glass sizes fall outside of manufacturer’s standard design charts for the following:

1.7.1.2.1 Perform glazing work in accordance with written recommendations from the glass manufacturer or glass fabricator.
1.7.1.2 Certify glass compatibility with glazing materials; such as insulating glass sealants, structural sealants and silicones, gaskets, setting blocks, and similar components

1.7.1.2.2 Verify glass design, heat treatment and thickness; analyze for thermal stress and maximum deflection.

1.7.1.3 Quality Limitations for Heat Strengthened and Tempered Glass:
Perform tempering or heat strengthening in accordance with CAN/CGSB 12.1 or ASTM C1048 and as follows:

1.7.1.3.1 Fabricate glass using horizontal roller heating process only, one direction on direction only, roller wave orientation to be negotiated and agreed upon with the Consultant.

1.7.1.3.2 Maximum deviation from flatness at any peak (peak to valley deviation), 0.08 mm at centre of lite and 0.20 mm within 265 mm of leading or trailing edge.

1.7.1.3.3 Apply heat treatment prior to the application of low-e coatings to minimize appearance of roller wave distortion.

1.7.2 Certifications: Provide the following during the course of the Work:

1.7.2.1 Compliance Certification: Provide certificates from manufacturer indicating tested performance requirements required by Authorities Having Jurisdiction and these specifications have been met.

1.8 MOCK-UPS

1.8.1 Provide sample panel in accordance with Section 01 45 00 – Quality Control and Section 08 44 13 – Glazed Aluminum Curtain Walls

1.8.2 Sample panel will be used to assess the required aesthetic appearance of glass lites installed on the project; Consultant reserves the right to request modifications to sealant colours in used in final assembly.

1.9 DELIVERY, STORAGE AND HANDLING

1.9.1 Delivery and Acceptance Requirements: Deliver packaged materials in their original containers with manufacturer's labels and seals intact.

1.9.2 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:

1.9.2.1 Install glass as soon as possible after delivery to site.
1.9.2.2 Handle glass carefully to its place of installation.
1.9.2.3 Prevent damage to glass, adjacent materials and surfaces.

1.10 SITE CONDITIONS

1.10.1 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:

1.10.1.1 Install glazing when ambient temperature is above 2°C of the manufacturer’s minimum and rising.
1.10.1.2 Maintain ventilated environment for 24 hours after installation.
1.10.1.3 Maintain minimum ambient temperature before, during and 24 hours after installation of glazing compounds.
1.11 WARRANTY

1.11.1 Special Warranty – Glass Seals: Provide manufacturer’s warranty for replacement of sealed glass units, covering defects in materials and workmanship for the period indicated, commencing from date of Substantial Performance of the Work:

1.11.1.1 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.

1.11.1.2 Evidence of Failure: Obstruction of vision by dust, moisture, or film on interior surfaces of glass.

1.11.1.3 Allowable Specific Exclusions: Breakage resulting from thermal stress will be accepted as a limitation to the warranty in accordance with CAN/CGSB 12.20

1.11.1.4 Warranty Period: Ten (10) years.

1.11.2 Special Warranty – Glass Delamination: Provide manufacturer’s warranty covering laminated glass units for a period of ten (10) years, covering defects in materials and workmanship resulting in edge separation or delamination within the field area of glass that obstructs or affects visibility through the laminated unit, commencing from date of Substantial Performance of the Work.

2 Products

2.1 MANUFACTURERS

2.1.1 Basis-of-Design Products: Products named in this Section were used as the basis-of-design for the project; manufacturers listed as additional acceptable materials 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.

2.1.1.1 Basis-of-Design Manufacturer: PPG Industries

2.1.2 Additional Acceptable Products Manufacturers: Subject to matching of colour and compliance with performance requirements specified in this Section; as established by the Basis-of-Design Products, use any of the listed manufacturers’ products in accordance with Section 01 62 00 – Product Options; following manufacturer’s do not require submission of a request for substitutions provided required shop drawing and product data submissions are submitted before starting any work of Section:

2.1.2.1 Vision Glass:

2.1.2.1.1 AGC Flat Glass North America (formerly AFG or AFGD)
2.1.2.1.2 AHC Glass (formerly Visteon)
2.1.2.1.3 Guardian Industries
2.1.2.1.4 Pilkington Glass of Canada
2.1.2.1.5 Prelco Inc.
2.1.2.1.6 Schott Glass AG
2.1.2.1.7 Viracon Inc.

2.1.3 Substitutions: Consultant may consider additional manufacturers having similar products to Acceptable Products Manufacturers listed above during the construction period, provided they meet the performance requirements established by the named products and provided they submit requests for substitution in accordance with 01 25 00 – Substitution Procedures before starting any work of this Section:

2.1.3.1 Do not use substitute materials to establish Bid Price.
2.1.3.2 Substitutions that appear as a part of the project without review and acceptance by the Consultant will be rejected, and replaced with one of the specified materials.

2.2 PERFORMANCE REQUIREMENTS

2.2.1 Building Envelope Performance: Provide continuity of building enclosure vapour and air barrier using Glass Glazing materials utilizing inner light of multiple lite insulated units for continuity of air and vapour seal.

2.2.2 Structural Design Performance: Provide glass products in thicknesses designed in accordance with CAN/CGSB 12.20 based on the following criteria:

2.2.2.1 Design Loads: Glass thicknesses listed in the specification are minimum thicknesses only; provide glass in actual thickness required to meet deflection criteria:

2.2.2.1.1 Reference Velocity Pressure: Velocity pressure ($q$) located in National Building Code Structural Commentaries, Wind Load and Effects, (Part 4 of Division B), based on probability of being exceeded in any one year of 1 in 50.

2.2.2.1.2 Glass Deflection: As indicated in Section 08 44 13 as required to maintain full contact with glazing throat.

2.2.2.2 Dimensions: Rectangular glass dimensions and aspect ratio as indicated on Drawings.

2.2.2.3 Configuration: Insulating Glass.

2.2.2.4 Multipliers: Modify glass thicknesses based on substituting heat treated or laminated glass configurations as required to obtain the most economical glass assembly.

2.3 GLASS MATERIALS

2.3.1 Float Glass: In accordance with CAN/CGSB-12.3, glazing quality and as follows:

2.3.1.1 Low Iron Glass: no tint

2.3.2 Low Iron Glass: Manufactured in accordance with CAN/CGSB-12.1 and ASTM C1048, heat soak tested in accordance with EN14179-1, and as follows:

2.3.2.1 Type: 2 – Tempered.

2.3.2.2 Class: B - Float Glass.

2.3.2.3 Roller Wave Tolerance: Notwithstanding requirements of ASTM C1048, limit distortions arising from tempering process to a maximum nominal 0.08 mm peak to valley at centre of glass and 0.20 mm within 265 mm of leading and trailing edges of the glass.

2.3.2.4 Category: II - Fully Tempered.

2.3.2.5 Basis-of-Design Material:

2.3.2.5.1 PPG, Skyline

2.3.3 Low Iron Laminated Safety Glass: In accordance with CAN/CGSB-12.1 as follows:

2.3.3.1 Type: 2 – Tempered.

2.3.3.2 Class: B - Float Glass.

2.3.3.3 Roller Wave Tolerance: Notwithstanding requirements of ASTM C1048, limit distortions arising from [tempering] [heat strengthening] process to a maximum nominal 0.08 mm peak to valley at centre of glass and 0.20 mm within 265 mm of leading and trailing edges of the glass.

2.3.3.4 Category: I - Heat Strengthened.

2.3.4 Low Iron Laminated Safety Glass: In accordance with CAN/CGSB-12.1 as follows:

2.3.4.1 Glass: Low Iron, tempered glass.
2.3.4.2 Type: 1 – Laminated.
2.3.4.3 Class: B - Float Glass.
2.3.4.4 Category: II - Fully Tempered
2.3.4.5 Minimum Thickness of Laminating Film:
   2.3.4.5.1 Sloped and Overhead Glazing Applications: 1.50 mm.

2.3.5 Spandrel Glass: to CAN/CGSB-12.9 and as follows:
2.3.5.1 Type: 2 - Heat Strengthened.
2.3.5.2 Class: A - Float glass.
2.3.5.3 Style: 3 - applied silicone elastomeric coating, minimum thickness 0.13 mm.
2.3.5.4 Form: Single Pane Applications: Form M.
2.3.5.5 Colour: Custom colour selected by Consultant
2.3.5.6 Basis-of-Design Material:
   2.3.5.6.1 Opaci-Coat 300.

2.3.6 Frit Glass Coating: In accordance with CAN/CGSB-12.13 and as follows:
2.3.6.1 Low iron glass, glazing quality, heat strengthened or tempered as required to prevent glass breakage arising from thermal shock.
2.3.6.2 Two-pass ceramic frit, with inside face grey, outside white. Dot size and pattern subject to mock-up approval by Consultant.

2.4 INSULATING GLASS
2.4.1 Insulating Glass Units: Provide sealed insulating glass units in accordance with CAN/CGSB-12.8 in configurations indicated, and as specified herein.
2.4.1.1 Manufacture sealed insulating glass units without edge channels or tape, that is, with bare glass edges.
2.4.1.2 Use two stage seal method of manufacture, as follows:
   2.4.1.2.1 Primary Seal: polyisobutylene sealing compound between glass and metal spacer/separator.
   2.4.1.2.2 Secondary Seal: polyurethane, silicone or polysulphide base sealant, filling gap between the two lites of glass at the edge up to the spacer/separator and primary seal.
2.4.1.3 Install stainless steel capillary breather tubes to equalize pressure differentials between insulating glass fabricating location and insulating glass installation location when required by manufacturer; seal tube immediately prior to installation in accordance with glass fabricator’s written instructions.
2.4.1.4 Spacer/Separator: Glass Fabricator’s standard stainless steel; coloured black, spacer containing desiccant, sealed to provide continuous vapour barrier between interior of sealed unit and secondary seal.
2.4.1.5 Sealants for Insulating Glass Units:
   2.4.1.5.1 Primary Seal: Polyisobutylene; colour black.
   2.4.1.5.2 Secondary Seal: Structural silicone based Type S-4 as specified in Section 07 92 00; compatible with SSG adhered curtain wall system specified in Section 08 44 13; colour black.
   2.4.1.5.3 Weathering Seal: Silicone based Type S-3 as specified in Section 07 92 00; standard colour selected by Consultant.

2.5 ACCESSORY MATERIALS
2.5.1 Glazing Tape: 100% polybutalene vehicle. Extruded in ribbon form with paper separator. Tape shall have an integral shim strip where required.
2.5.2 Setting Blocks: Silicone, Shore A Hardness 90; Shims Shore A Hardness 50.
2.5.3 Spacers: Silicone and other resilient blocks of 40 to 50 Shore A durometer hardness, adhesive-backed on one face only, tested for compatibility with specified primary and secondary glazing materials.

2.5.4 Glazing Compound: For glazing to metal, in accordance with CAN/CGSB 19.2.

2.5.5 Cleaners, Primers, and Sealers: Type recommended by manufacturer of glass and gaskets.

2.6 FABRICATION

2.6.1 Cut all glass to field measurement with proper clearances. Cut to produce clean, straight edges with no chips, cracks or flaws.

2.6.2 Make any cut outs, openings to approved drawings. Grind exposed edges smooth round off corners.

2.6.3 Cut wired glass so that wires are parallel with edges both vertically and horizontally.

2.7 FABRICATION - INSULATING GLASS

2.7.1 Shop fabricate insulating glass units in accordance with CAN/CGSB.12.8 and IGMAC certification as a minimum.

2.7.2 Sealed units shall have minimum 13 mm air spaces giving a total overall thickness of not less than 44 mm for triple sealed units. Edge spacer shall not bow in or out more than 5 mm over full length of a side.

2.7.3 Sealed units shall be assembled and air space sealed in a clean, dry environment.

2.7.4 Sealed units shall be assembled and air space sealed in a clean, dry environment, to suit local barometric air pressure conditions to prevent distortion of sealed units.

2.7.5 Unit types, make-up and colour shade as listed at end of this Section.

3 Execution

3.1 EXAMINATION

3.1.1 Verify that openings for glazing are correctly sized and within tolerance.

3.1.2 Verify that surfaces of glazing channels or recesses are clean, free of obstructions, and ready to receive glazing.

3.2 PREPARATION

3.2.1 Ensure all glazing rebates smooth and true, free of projections nails, screws, fastenings properly set to prevent contact with glass.

3.2.2 Ensure all stops, splines, glazing accessories provided by others accurately cut to length and proper size and type for specific glazing.

3.2.3 Clean contact surfaces with solvent and wipe dry.

3.2.4 Seal porous glazing channels or recesses with substrate compatible primer or sealer.

3.2.5 Prime surfaces scheduled to receive sealant.

3.3 INSTALLATION

3.3.1 Install in accordance with the manufacturer’s written instructions and the contract documents, plumb, true, level and rigid.

3.3.2 Do not glaze when ambient or surface temperatures are less than 4°C. Glazing rebates, stops and glass shall be dry, free from ice, frost slick, grease, oil, dust, rust, or other matter detrimental to adhesion of tape, glazing compounds and sealant.
3.3.3 Installation of glass shall be by workmen skilled in this trade in strict accordance with manufacturer's directions, to produce a first class installation.

3.3.4 Position sealed units to provide minimum 12 mm glass bite, and minimum 6 mm perimeter clearance between glass and framing.

3.3.5 Glass shall be free from contact with the frames and stops.

3.3.6 Label each light to show manufacturer's name or trade mark, quality and thickness.

3.3.7 Glaze interior doors with foam or cork tape on both sides. – For wired glass, use glazing tape. – Trim tape even with the sight line.

3.3.8 Use sealant at exterior doors, sealing water and weather tight.

3.3.9 Sealed Units: Install sealed units in accordance with fabricator's written instructions, taking care not to warp or twist glass to prevent stress or breaking of glass seals and as follows:

3.3.9.1 Crimp capillary breather tube in accordance with fabricator's written instructions, and as follows:

3.3.9.1.1 Do not trim sealant from around base of tube.
3.3.9.1.2 Do not pull or attempt to remove the tube.
3.3.9.1.3 Crimp tube immediately prior to installing sealed unit by placing pliers perpendicular to tube 25 mm from end of tube.
3.3.9.1.4 Do not permit tube to be exposed to or sit in water.
3.3.9.1.5 Cover tube with stainless steel strip and set in sealant bead compatible with insulated glass sealants.

3.4 GLASS SCHEDULE

3.4.1 Skylights:

3.4.1.1 Insulating Glass Unit Composition: GL-4

3.4.1.1.1 Exterior Lite: 10 mm Low iron tempered, having high performance Low E coating Solarban 72 on #2 surface.
3.4.1.1.2 Air Space: 13 mm Argon filled.
3.4.1.1.3 Middle Lite: 6 mm Low iron heat strengthened.
3.4.1.1.4 Air Space: 13 mm Argon filled.
3.4.1.1.5 Interior Lite: 12 mm Low iron tempered laminated glass having high performance Low E coating Solarban 60 on #5 surface.
3.4.1.1.6 Basis-of-Design Material: PPG

3.4.2 Aluminum curtain wall:

3.4.2.1 Insulating Glass Unit Composition: GL-1

3.4.2.1.1 Exterior Lite: 6 mm Low iron heat strengthened or tempered, having high performance Low E coating Solarban 72 on #2 surface.
3.4.2.1.2 Air Space: 13 mm Argon filled.
3.4.2.1.3 Middle Lite: 6 mm Low iron heat strengthened.
3.4.2.1.4 Air Space: 13 mm Argon filled.
3.4.2.1.5 Interior Lite: 6 mm Low iron tempered glass having high performance Low E coating Solarban 60 on #5 surface.
3.4.2.1.6 Basis-of-Design Material: PPG

3.4.2.2 Unit Properties:

3.4.2.2.1 USI Factor 0.69 W/m²-K.
3.4.2.2.2 Solar Heat Gain Coefficient (SHGC): 0.273
3.4.2.2.3 Visible Light Transmission (Tv): 0.58
3.4.2.3 Insulating Glass Unit Composition: GL-2

3.4.2.3.1 Exterior Lite: 6 mm Low iron heat strengthened or tempered, having frit coating Two-pass ceramic frit, with inside face grey, outside white. Dot size and pattern subject to mock-up approval by Consultant on surface #2

3.4.2.3.2 Air Space: 13 mm Argon filled.

3.4.2.3.3 Middle Lite: 6 mm Low iron heat strengthened having high performance Low E coating Solarban 72 on #3 surface

3.4.2.3.4 Air Space: 13 mm Argon filled.

3.4.2.3.5 Interior Lite: 6 mm Low iron tempered glass having high performance Low E coating Solarban 60 on #5 surface.

3.4.2.3.6 Basis-of-Design Material: PPG

3.4.2.4 Unit Properties:

3.4.2.4.1 USI Factor 0.69 W/m²-K.

3.4.2.4.2 Solar Heat Gain Coefficient (SHGC): 0.196

3.4.2.4.3 Visible Light Transmission (Tvis): 0.33

3.4.2.5 Monolithic Glass: GL-5

3.4.2.5.1 Lite: 10 mm Low iron tempered glass

3.4.2.6 Insulating Glass Unit Composition: GL-6

3.4.2.6.1 Exterior Lite: 6 mm Low iron heat strengthened or tempered, having frit coating of white dots, nominal 3 mm diameter of 60% coverage on surface #2

3.4.2.6.2 Air Space: 13 mm Argon filled.

3.4.2.6.3 Middle Lite: 6 mm Low iron heat strengthened having high performance Low E coating Solarban 72 on #3 surface

3.4.2.6.4 Air Space: 13 mm Argon filled.

3.4.2.6.5 Interior Lite: 6 mm Low iron tempered glass having high performance Low E coating Solarban 60 on #5 surface.

3.4.2.6.6 Basis-of-Design Material: PPG

3.4.2.7 Unit Properties:

3.4.2.7.1 USI Factor 0.69 W/m²-K.

3.4.2.7.2 Solar Heat Gain Coefficient (SHGC): 0.196

3.4.2.7.3 Visible Light Transmission (Tvis): 0.33

3.4.2.8 These values were derived using LBNL WINDOW 7 Software, and represent design values used to establish heating and cooling loads for the building.

3.4.2.9 Substitute materials shall verify performance with the Consultant prior to submitting a Bid Price.

3.4.3 Spandrel Insulating Glass Units:

3.4.3.1 Unit Composition: GL-1a

3.4.3.1.1 Exterior Lite: 6 mm Low iron heat strengthened or tempered, having high performance Low E coating Solarban 72 on #2 surface.

3.4.3.1.2 Air Space: 13 mm Argon filled.

3.4.3.1.3 Middle Lite: 6 mm Low iron heat strengthened.

3.4.3.1.4 Air Space: 13 mm Argon filled.

3.4.3.1.5 Interior Lite: 6 mm Low iron tempered glass having high performance Low E coating Solarban 60 on #5 surface and custom opaci-coat on surface #6.
3.4.3.2 Unit Composition: GL-2a

3.4.3.2.1: 6 mm Low iron heat strengthened or tempered, having frit coating Two-pass ceramic frit, with inside face grey, outside white. Dot size and pattern subject to mock-up approval by Consultant on surface #2

3.4.3.2.2 Air Space: 13 mm Argon filled.

3.4.3.2.3 Middle Lite: 6 mm Low iron heat strengthened having high performance Low E coating Solarban 72 on #3 surface

3.4.3.2.4 Air Space: 13 mm Argon filled.

3.4.3.2.5 Interior Lite: 6 mm Low iron tempered glass having high performance Low E coating Solarban 60 on #5 surface and custom opaci-coat on surface #6

3.4.3.3 Unit Composition: GL-6a

3.4.3.3.1: 6 mm Low iron heat strengthened or tempered, having frit coating of white dots, nominal 3 mm diameter of 60% coverage on surface #2

3.4.3.3.2 Air Space: 13 mm Argon filled.

3.4.3.3.3 Middle Lite: 6 mm Low iron heat strengthened having high performance Low E coating Solarban 72 on #3 surface

3.4.3.3.4 Air Space: 13 mm Argon filled.

3.4.3.3.5 Interior Lite: 6 mm Low iron tempered glass having high performance Low E coating Solarban 60 on #5 surface and custom opaci-coat on surface #6

3.4.3.4 A sealed unit has been specified so that the outside appearance of the completed spandrel appears similar to adjacent vision glass units.

3.4.4 Other glass types as indicated on Drawings.

END OF SECTION
1 General

1.1 SUMMARY

1.1.1 This Section includes louvres that form a part of architectural building finishes as part of Wall Type WT-11 and includes, but is not limited to, the following:

1.1.1.1 Fixed, extruded horizontal aluminum louvres, no exposed mullions.

1.2 RELATED REQUIREMENTS

1.2.1 Section 03 30 00 – Cast-In-Place Concrete: Adjacent construction, rough opening requirements.

1.2.2 Section 03 45 00 – Precast Architectural Concrete: Adjacent construction

1.2.3 Section 04 81 00 – Unit Masonry Assemblies: Adjacent construction, rough opening requirements.

1.2.4 Section 05 41 00 – Structural Metal Stud Framing: Adjacent construction, rough opening requirements.

1.2.5 Section 07 05 10 – Common Work Results for Air Barrier and Vapour Retarder Systems.

1.2.6 Section 07 25 13 – Air and Vapour Membranes: Connections between air and vapour membranes and blank off panels.

1.2.7 Section 07 42 13 – Metal Wall Cladding: Adjacent construction

1.2.8 Section 07 92 00 – Sealants: Sealants installed in perimeter joints between louvre frames and adjoining construction.

1.2.9 Section 23 31 00 – Ductwork: Connection of ductwork and louvres.

1.3 DEFINITIONS

1.3.1 Louvre Terminology: Definitions of terms for metal louvres contained in AMCA 501 apply to this Section unless otherwise defined in this Section or in referenced standards.

1.4 REFERENCE STANDARDS

1.4.1 Air Movement and Control Association International Inc. (AMCA):

1.4.1.1 AMCA 500-L-07, Laboratory Methods of Testing Louvres for Rating

1.4.1.2 AMCA 501-03, Application Manual for Air Louvres

1.4.2 American Society for Testing and Materials (ASTM):

1.4.2.1 ASTM B221-13, Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes

1.4.2.2 ASTM E90-04, Standard Test Method for Laboratory Measurement of Airborne Sound Transmission Loss of Building Partitions and Elements

1.4.3 Canadian Standards Association (CSA):

1.4.3.1 CSA W47.1-09, Certification of Companies for Fusion Welding of Steel

1.4.3.2 CSA W47.2-11, Certification of Companies for Fusion Welding of Aluminum

1.4.3.3 CSA W59-03, Welded Steel Construction (Metal Arc Welding), Metric

1.4.3.4 CSA W59.2-1991 (R2003), Welded Aluminum Construction
1.4.4 NAAMM's "Metal Finishes Manual for Architectural and Metal Products"
1.4.5 SMACNA's "Architectural Sheet Metal Manual"

1.5 ADMINISTRATIVE REQUIREMENTS

1.5.1 Coordination: Coordinate installation of system with work specified in other Sections to ensure proper placement and installation of vapour barrier, insulation and flashing in order that air, vapour and thermal barrier of building is intact and moisture will be diverted to the exterior, and as follows:

1.5.1.1 Coordinate setting drawings, diagrams, templates, instructions, and directions for installation of anchorages that are embedded in concrete or masonry construction.

1.5.1.2 Coordinate delivery of anchorages and embedments with affected related Sections.

1.5.1.3 Coordinate installation of sealants so that ambient and surface temperatures are greater than 5°C from time of application until sealants have cured.

1.5.1.4 Coordinate design of louvre elements to tie into adjacent building envelope elements.

1.5.1.5 Coordinate Work of this Section with installation of ductwork to rear of louvres, and adjacent components or materials.

1.6 SUBMITTALS

1.6.1 Provide required information in accordance with Section 01 33 00 – Submittal Procedures.

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

1.6.2.1 Product Data: Submit product data for each type of product specified; include printed catalogue sheet showing specified materials indicating AMCA Certified Ratings Seals where AMCA seals are required by the specification.

1.6.2.2 Shop Drawings: Submit shop drawings indicating plans, elevations, sections, details, and attachments to adjacent construction including; but not limited to, the following:

1.6.2.2.1 Blade profiles, angles, and spacing.

1.6.2.2.2 Structural analysis data signed and sealed by a qualified professional engineer responsible for preparation of shop drawings for installed louvres required to meet structural design loads.

1.6.2.2.3 Connecting interface between air barrier and vapour retarder membrane and Blank Off panels, clearly indicating continuous seal.

1.6.2.3 Samples: Submit samples of factory applied coatings and finishes for Consultant's initial selection. Submit samples for each exposed metal finish required for project for verification by Consultant before fabricating materials for this project.

1.6.3 Information submittals: Provide the following:

1.6.3.1 Submit product test reports based on evaluation of comprehensive tests performed by a qualified testing agency; or by manufacturer and witnessed by a qualified testing agency, for each type of louvre required for this project.
1.6.1 Sustainable Design Submittals: Coordinate project sustainable design requirements with Section 01 35 31 - LEED Special Project Procedures and Section 01 35 31A - LEED Material Information Sheet for LEED Submittals.

1.7 PROJECT CLOSEOUT SUBMISSIONS

1.7.1 Operation and Maintenance Data: Submit manufacturer’s written instructions for repair and cleaning, operations and maintenance procedures, include name of original installer and contact information in accordance with Section 01 78 23 – Operation and Maintenance Data.

1.7.2 Record Documentation: Submit as constructed information in accordance with Section 01 78 39 – Project Record Documents.

1.8 QUALITY ASSURANCE

1.8.1 Obtain louvres from a single source and manufacturer, ensuring they are of same type, design, or factory applied colour finish.

1.8.2 Perform welding for structural quality joins using procedures and personnel having certifications specific to the work of this Section in accordance with CSA W47.2 and W59.2.

1.8.3 Construct flashings in accordance with recommendations in SMACNA Architectural Sheet Metal Manual for fabrication, construction details, and installation procedures.

1.8.4 Follow NAAMM’s recommendations for applying and designating finishes; finish louvres after assembly.

1.9 SITE CONDITIONS

1.9.1 Site Measurements: Verify louvre openings by site measurements before fabrication and indicate measurements on Shop Drawings.

1.9.2 Established Dimensions: Establish opening dimensions and proceed with fabricating louvres without site measurements. Coordinate construction to ensure that actual opening dimensions correspond to established dimensions.

2 Products

2.1 MANUFACTURERS

2.1.1 Basis-of-Design products are named in this Section; additional manufacturers offering similar Products may be incorporated into the work provided they meet the performance requirements established by the named products, and provided they submit requests for substitution in accordance with Section 01 62 00 – Product Options.

2.1.1.1 Basis-of-Design Product: TenPlus, Model H4451

2.1.2 Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

2.1.2.1 Airolite Company LLC
2.1.2.2 Construction Specialties Company
2.1.2.3 Greenheck Fan Corporation
2.1.2.4 Haakon Industries
2.1.2.5 Nystrom Airline Products Co.
2.1.2.6 Western Ventilation Products Ltd.
2.1.3 Substitutions: Consultant may consider additional manufacturers having similar products to Acceptable Materials Manufacturers listed above during the construction period, provided they meet the performance requirements established by the named products and provided they submit requests for substitution in accordance with 01 25 00 – Substitution Procedures before starting any work of this Section:

2.1.3.1 Do not use substitute materials to establish Bid Price.
2.1.3.2 Substitutions that appear as a part of the project without review and acceptance by the Consultant will be rejected, and replaced with one of the specified materials.

2.2 PERFORMANCE REQUIREMENTS

2.2.1 Provide louvres that allow for thermal movements resulting from the following maximum change (range) in ambient and surface temperatures by preventing buckling, opening of joints, overstressing of components, failure of connections, and other detrimental effects. Base engineering calculation on surface temperatures of materials due to both solar heat gain and night time sky heat loss:

2.2.1.1 Winter Minimum: Ambient -40°C, Surface -35°C.
2.2.1.2 Summer Maximum: Ambient +35°C, Surface +50°C.
2.2.1.3 Temperature Range: Ambient 75°C, Surface 85°C difference.

2.2.2 Provide louvres having air performance, water penetration, air leakage, and wind driven rain ratings in accordance with performance requirements listed in this Section and as demonstrated by testing manufacturer's stock units identical to those provided, except for length and width in accordance with AMCA 500-L.

2.3 MATERIALS

2.3.1 Aluminum Extrusions: ASTM B221, alloy 6063-T5 or T-52.
2.3.2 Aluminum Sheet: ASTM B209M, alloy 3003 or 5005 with temper as required for forming, or as otherwise recommended by metal producer for required finish.
2.3.3 Aluminum Castings: ASTM B26M, alloy 319.
2.3.4 Fasteners: Provide fasteners of same basic metal and alloy as fastened metal or 300 Series stainless steel; use only metals that are incompatible with joined materials, and as follows:

2.3.4.1 Use types and sizes to suit unit installation conditions.
2.3.4.2 Use hex head or Phillips pan head screws for exposed fasteners.

2.3.5 Bituminous Paint: Cold applied asphalt emulsion in accordance with ASTM D1187, and is compliant with LEED(R) VOC limit of 250 g/L.

2.4 FIXED, EXTRUDED ALUMINUM LOUVRES

2.4.1 Horizontal, Continuous Line Louvre: Wall locations as indicated, concealed mullions and concealed frames.

2.4.1.1 Louvre Depth: Nominal 102 mm.
2.4.1.2 Frame and Blade Thickness: Manufacturer’s standard for blades and frames to suit structural requirements, with integral mounting frame coordinated with adjacent construction.
2.4.1.3 Louver blades shall be fixed on a 45° angle, and on 102 mm centers extruded aluminum construction.
2.4.1.4 Performance Requirements:

2.4.1.4.1 Percent Free Area: 53%
2.4.1.4.2 Air Performance: In accordance with AMCA 511 and as follows:
- Free Area Velocity at Beginning Point of Water Penetration: Nominal 195 m/min

2.4.1.4.3 Structural Performance: Limit maximum deflection of louvres and louvre frames to L/360 in all directions.

2.4.1.5 Mark units with AMCA Certified Ratings Seal.

2.5 LOUVRE SCREENS

2.5.1 Provide screen at each exterior louvre, and as follows:
- 2.5.1.1 Screen Location for Fixed Louvres: Interior face.
- 2.5.1.2 Screening Type: Bird screening 12.7 mm x 12.7 mm openings.

2.5.2 Secure screens to louvre frames with stainless-steel machine screws, spaced a maximum of 150 mm from each corner and at 300 mm O/C.

2.5.3 Louvre Screen Frames: Fabricate with mitred corners to suit louvre sizes, and as follows:
- 2.5.3.1 Material: Same kind and form of metal as indicated for louvre that screens are attached; reinforce extruded-aluminum screen frames at corners with clips.
- 2.5.3.2 Finish: Mill finish.
- 2.5.3.3 Type: Rewirable frames with a driven spline or insert for securing screen mesh.

2.6 BLANK OFF PANELS

2.6.1 Un-Insulated, Blank Off Panels:
- 2.6.1.1 Face Sheet: Aluminum, 0.8mm nominal sheet thickness.
- 2.6.1.2 Panel Finish: Same finish applied to louvres.
- 2.6.1.3 Attach Blank Off panels to back of louvre frames with stainless steel, sheet metal screws.
- 2.6.1.4 Finish: To match louvre frame, but black color.

2.6.2 Insulated, Blank-off Panels: Laminated metal-faced panels consisting of insulating core surfaced on back and front with metal sheets.
- 2.6.2.1 Thickness: 50 mm.
- 2.6.2.2 Metal Facing Sheets: Aluminum sheet, not less than 0.8-mm nominal thickness.
- 2.6.2.3 Insulating Core: Type 3 foamed-plastic rigid insulation board.
- 2.6.2.4 Edge Treatment: Trim perimeter edges of blank-off panels with louver manufacturer's standard extruded-aluminum-channel frames, not less than 2.0-mm nominal thickness, with corners mitered and with same finish as panels.
- 2.6.2.5 Panel Finish: Same type of finish applied to louvers, but black color.
- 2.6.2.6 Select one of two options below or revise to suit Project. Other methods include slide bolts and cam latches with or without hinges.
- 2.6.2.7 Attach blank-off panels to back of louvre frames with stainless-steel, sheet metal screws.

2.7 FABRICATION

2.7.1 Assemble louvres in factory to minimize site splicing and assembly.
2.7.2 Disassemble units as necessary for shipping and handling limitations.
2.7.3 Clearly mark units for reassembly and coordinated installation.
2.7.4 Fabricate vertical assemblies to permit site bolted assembly with close fitting, reinforced joints in jambs and mullions where height of louvre units exceeds fabrication and handling limitations, and as follows:

2.7.4.1 Continuous Assemblies: Fabricate units without interrupting blade spacing pattern.

2.7.5 Maintain equal louvre blade spacing, including separation between blades and frames at head and sill, to produce uniform appearance.

2.7.6 Fabricate frames; including integral sills, to fit in openings with allowances made for fabrication and installation tolerances, adjoining material tolerances, and perimeter sealant joints.

2.7.7 Include supports, anchorages, and accessories required for complete assembly.

2.7.8 Provide vertical mullions of type and at spacing indicated, but not more than recommended by manufacturer, 1800 mm O/C, whichever is less, and as follows:

2.7.8.1 Fully Recessed Mullions:

2.7.8.1.1 Provide mullions fully recessed behind louvre blades.
2.7.8.1.2 Fabricate with close fitting blade splices designed to permit expansion and contraction where length of louvre exceeds fabrication and handling limitations.

2.7.9 Join frame members to each other and to fixed louvre blades with fillet welds concealed from view or size of louvre assembly makes bolted connections between frame members necessary.

2.7.10 Exterior Corners: Prefabricated corner units with mitred and welded blades and concealed mullions at corners.

2.7.11 Provide sub-sills made of same material as louvres or extended sills for recessed louvres.

2.7.12 Join frame members to each other and to fixed louvre blades with fillet welds concealed from view or size of louvre assembly makes bolted connections between frame members necessary.

2.8 ALUMINUM FINISHES

2.8.1 Finish designations prefixed by AA comply with the system established by the Aluminum Association for designating aluminum finishes.

2.8.2 High Performance Organic Finish:

2.8.2.1 3 Coat PVDF Coating: AA-C12 Chemical Finish, cleaned with inhibited chemicals; C40 Chemical Finish, conversion coating; R1x Organic Coating, manufacturer's standard 3 coat, thermo-cured system consisting of specially formulated inhibitive primer, fluoropolymer colour coat, and clear fluoropolymer topcoat, with both colour coat and clear topcoat containing not less than 70% PVDF resin by weight; prepare, pre-treat, and apply coating to exposed metal surfaces in accordance with AAMA 2605 and with coating and resin manufacturers' written instructions.

2.8.2.2 Colours: Custom colour white and custom colour to match adjacent precast

2.8.2.3 Basis-of-Design Materials: PPG Duranar XL

3 Execution

3.1 EXAMINATION

3.1.1 Examine substrates and openings and verify requirements for installation tolerances and other conditions affecting performance.
3.1.2 Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

3.2.1 Locate and place louvres level and plumb at indicated alignment with adjacent work.

3.2.2 Use concealed anchorages where possible; provide brass or lead washers fitted to screws where required to protect metal surfaces and to make a weather tight connection.

3.2.3 Form closely fitted joints with exposed connections accurately located and secured.

3.2.4 Provide perimeter reveals and openings of uniform width for sealants and joint fillers.

3.2.5 Repair finishes damaged by cutting, welding, soldering, and grinding, and as follows:
   3.2.5.1 Restore finishes so no evidence remains of corrective work.
   3.2.5.2 Return items that cannot be refinished in the site to the factory, make required alterations, and refinish entire unit or provide new units.

3.2.6 Protect galvanized and nonferrous metal surfaces that will be in contact with concrete, masonry, or dissimilar metals from corrosion or galvanic action by applying a heavy coating of bituminous paint on surfaces.

3.2.7 Install concealed gaskets, flashings, joint fillers, and insulation as louvre installation progresses where weather tight louvre joints are required, refer to Section 07 92 00 for sealants applied during louvre installation.

3.3 ADJUSTING AND CLEANING

3.3.1 Clean exposed surfaces of louvres [and vents] that are not protected by temporary covering, to remove fingerprints and soil during construction period; do not let soil accumulate until final cleaning.

3.3.2 Clean exposed surfaces with water and a mild soap or detergent not harmful to finishes, and thoroughly rinse surfaces and dry before final inspection.

3.3.3 Restore louvres damaged during installation and construction so no evidence remains of corrective work; remove damaged units and replace with new units where results of restoration are unsuccessful, as determined by Consultant.

3.3.4 Touch up minor abrasions in finishes with compatible air dried coating matching colour and gloss of factory applied finish coating.

END OF SECTION
1 General

1.1 SUMMARY

1.1.1 This Section provides requirements for supply and installation of chemical resistant polyurethane and polyurea primary containment spray on lining for concrete substrates including surface preparation and application of accessories required for a complete and water tight installation.

1.1.2 Location: Cistern & Water Entry Room 0008.

1.2 RELATED REQUIREMENTS

1.2.1 Section 01 12 00 – Phased Construction Summary

1.2.2 Section 01 31 13 - Project Co-ordination

1.2.3 Section 01 33 00 – Submittal Procedures

1.2.4 Section 01 35 31 - LEED Special Project Procedures

1.2.5 Section 03 30 00 - Structural Cast-in-Place Concrete

1.3 REFERENCE STANDARDS

1.3.1 American Society for Testing and Materials (ASTM):


1.3.1.2 ASTM D412 - 06ae2 Standard Test Methods for Vulcanized Rubber and Thermoplastic Elastomers—Tension

1.3.1.3 ASTM E96/E96M-10, Standard Test Method for Water Vapor Transmission of Materials

1.4 SUBMITTALS

1.4.1 Provide required information in accordance with Section 01 33 00 – Submittal Procedures.

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

1.4.2.1 Product Data: Submit manufacturer's literature for each product indicating the following:

1.4.2.1.1 Preparation instructions and recommendations

1.4.2.1.2 Storage and handling requirements and recommendations

1.4.2.1.3 Manufacturer's printed installation instructions for each product

1.4.3 Informational Submittals: Provide the following submittals during the course of the work:

1.4.3.1 Certificates: Submit manufacturer's certification that proposed materials, details and systems meet manufacturer's requirements; provide recommendation where portions of design are at variance with manufacturer's specifications required for a waterproof installation.
1.4.4 Sustainable Design Submittals: Coordinate project sustainable design requirements with Section 01 35 31 – LEED® Special Project Procedures and Section 01 35 31A - LEED Material Information Sheet for LEED Submittals.

1.5 QUALITY ASSURANCE

1.5.1 Qualifications: Provide proof of qualifications when requested by Consultant:

1.5.1.1 Manufacturer: Obtain materials from a company specializing in manufacturing cementitious waterproofing materials specified in this Section having a minimum 10 years documented experience.

1.5.1.2 Installer: Use manufacturer trained and accepted installer that is having documented experience with similar complexity and extent required for this project.

1.6 DELIVERY, STORAGE AND HANDLING

1.6.1 Delivery and Storage Requirements: Deliver materials to site in manufacturer's original, unopened containers and packaging, with labels clearly identifying product name and manufacturer.

1.6.2 Storage and Handling Requirements: Store materials in a clean, dry area in accordance with manufacturer's instructions; protect materials during handling and application to prevent damage or contamination.

1.7 SITE CONDITIONS

1.7.1 Ambient Conditions: Maintain manufacturer's recommended surface and ambient air temperature range during installation and until materials are fully cured and as follows:

1.7.1.1 Wet Weather Precautions: Cover materials when installing during precipitation to prevent streaking of finished surfaces for a minimum of 48 hours after installation.

1.7.1.2 Cold Weather Precautions: Install only during rising temperature during cold weather conditions; do not install to frozen or frost covered surfaces; provide electrical heaters to protect material from freezing during and for a minimum of 48 hours after installation.

1.7.1.3 Hot Weather Precautions: Provide shade and shelter to protect materials from rapid evaporation of water content during curing period using water misting or surface applied evaporation retarders recommended by manufacturer.

2 Products

2.1 MANUFACTURERS

2.1.1 Basis-of-Design Products: Products named in this Section were used as the basis-of-design for the project; additional manufacturers offering similar products may be incorporated into the work of this Section provided they meet the performance requirements established by the named products and provided they submit requests for substitution in accordance with Section 01 62 00 – to be reviewed by the Consultant after the close of Bids.
2.2 MANUFACTURER

2.2.1 Acceptable manufacturer:

2.2.1.1 “Polibrid 705” elastomeric polyurethane lining system as manufactured by Poibrid Coatings, Inc., (956) 831-7818.

2.3 PERFORMANCE REQUIREMENTS

2.3.1 Primary water containment: Materials specified in this section must be nontoxic and are intended for use within occupied (indoor) spaces and are required to maintain waterproofing layer conforming to irregular surface features within concrete containment tank; materials must be compatible with substrate without losing bond.

2.4 MATERIALS

2.4.1 Polyurethane liner: is a two-component, 100% solids (no VOCs, no solvents), elastomeric polyurethane lining system specifically designed for excellent chemical resistance, moderate crack bridging, waterproof membrane barrier against positive water pressure and as follows:

2.4.1.1 Colour: To be selected from manufacturer’s standard range
2.4.1.2 Volatile Organic Compound Content: 0 g/L
2.4.1.3 Hardness (Shore D) 61-65 ASTM D-2240
2.4.1.4 Tensile Strength (psi)* 2 880 ASTM D-412
2.4.1.5 Elongation (%)* 52 ASTM D-412
2.4.1.6 Tear Strength, Die C (pli) 180 – 190 ASTM D-624
2.4.1.7 Taber Abrasion Resistance (mg of loss/1000 cycles), CS17 wheel; 1000 grams weight 36.7 ASTM D-4060
2.4.1.8 Impact Resistance direct and reverse impact resistance of 160 in-lb to ASTM D2794

2.4.1.2 Basis-of-Design Materials: “Polibrid 705”

2.4.2 Design thickness: Minimum average of 2 mm (80 mils).

2.4.3 Repair Mortar: Water-based epoxy repair mortar, cement and aggregate filled.

2.4.3.1 Acceptable material:

2.4.3.1.1 Carboline “Carboguard 510”

2.4.4 Primer: Phenalkamine high performance epoxy immersion grade, high solids, low voc, semi-gloss finish.

2.4.4.1 Acceptable material:

2.4.4.1.1 Carboline “Carboguard 691”

2.5 ACCESSORIES

2.5.1 Structural repair mortars, cleaners and other materials recommended by manufacturer and required for a complete and waterproof installation.
3 Execution

3.1 EXAMINATION

3.1.1 Verification of Conditions: Verify that substrates and conditions for installation of waterproofing materials meet manufacturer’s requirements before beginning of installation of products specified in this Section.

3.1.1.1 Installation of products specified in this Section will denote acceptance of site conditions.

3.1.2 Pre-installation Testing: Conduct bond test in accordance with manufacturer’s instructions to verify proper surface preparation.

3.2 PREPARATION

3.2.1 Protect adjacent surfaces not designated to receive polyurethane lining from work of this Section.

3.2.2 Substrate Preparation: Follow manufacturer’s instructions to clean and prepare surfaces and seal cracks and joints and as follows:

3.2.2.1 Remove oil, grease, dirt, loose particles, remains of form oils, water repellents, and rust or other coatings using high pressure water blasting, wet or dry sand blasting, or other mechanical means to produce surfaces suitable for application of waterproofing.

3.2.2.2 Voids in Concrete Substrates: Pre-treat voids 6 mm diameter and larger with patching compound.

3.2.2.3 Rinse surfaces being waterproofed with clean water to saturated surface dry condition with no standing water on horizontal surfaces.

3.2.3 Surface Repair: Use polymer modified structural repair mortar recommended by manufacturer to patch honeycombing and air pockets, and other surfaces having defects more than 6 mm in depth.

3.2.4 Uneven Surfaces and Form Displacement: Chip away uneven concrete arising from concrete form misplacement or adhesions projecting from the face of concrete surfaces and patch surface smooth.

3.3 INSTALLATION

3.3.1 Mix two component lining material in proportions recommended by manufacturer; maintain a copy of manufacturer’s installation instructions and diagrams on site for Consultant’s review during construction.

3.3.2 Apply lining material in thickness and number of coats required by manufacturer to achieve waterproofing applicable to project conditions and as follows:

3.3.2.1 Do not bridge cracks greater than 1.5 mm

3.3.2.2 Bridge dynamic cracks or joints using elastomeric joint sealing tape, or as recommended by manufacturer.

3.3.2.3 Do not overcoat waterproofing material with solvent based materials

3.3.3 Cure polyurethane materials in accordance with manufacturer’s recommendations for subsequent coating of liner material.

3.3.4 Protect surfaces from rain, frost and prolonged direct UV until final cure.
3.4 SITE QUALITY CONTROL

3.4.1 Testing of Waterproofed Structures: Site testing and inspections will be performed in accordance with requirements specified in Section 01 45 00 – Quality Control and as follows:

3.4.1.1 Fill waterproofed structures with water to verify watertight installation immediately following application, curing and completion of related work of this Section.
3.4.1.2 Fill at a uniform rate not more than 2 metres within 24 hours.
3.4.1.3 Temper fill water to within a range of ±5°C of ambient air and structure at time of filling to reduce the likelihood of temperature induced cracking of structural concrete.
3.4.1.4 Fill waterproofed structures tank(s) to capacity; standing not less than 3 days; drain waterproofed structures and performing repairs where leakage occurs after this period.
3.4.1.5 Confirm watertight condition by measuring water depth.
3.4.1.6 Notify Owner before draining waterproofed structures; and submit proposed repair procedures to Consultant.
3.4.1.7 Retest waterproofed structures after repairs to verify that repairs were successfully applied.

3.5 CLOSEOUT ACTIVITIES

3.5.1 Cleaning: Remove left over materials and any foreign material resulting from the work from site and clean adjacent surfaces as required by Section 01 74 23 – Final Cleaning.
1 GENERAL:

1.1 WORK INCLUDED

1.1.1 This performance specification section is intended to cover the requirements of the complete Exterior Building Maintenance Equipment (BME) for the New Central Library project in Calgary, Alberta including all material and work necessary to accomplish complete installation. Refer to bid drawings for concept.

1.1.2 Related work for this division, performed and executed by others shall be identified and listed for this equipment.

1.1.3 All bidders shall provide proposed drawings indicating the nature and scope of their submittal including method and equipment to access all exterior areas. No area shall be more than arm’s reach for maintenance purposes.

1.1.4 Work of this section, as shown or specified, shall be in accordance with the requirements of the contract documents.

1.1.5 Design, fabrication, supply and install the building maintenance equipment that can be used to reach all surfaces of the entire building.

1.1.6 These documents are conceptual in nature and do not necessarily indicate or describe all work required for the complete performance and completion of the work.

1.1.7 The decision of the owner as to the items of work reasonably included in this specification shall be final and binding.

1.1.8 Check the site conditions before submitting design drawings and determining the method of attachment. The drawings are provided for the basic intent and concept.

1.1.9 All drilled in items related to the BME are provided by this equipment supplier and installation of such items is by the BME contractor.

1.2 WORK NOT INCLUDED:

1.2.1 Electrical Power Outlets: A twist lock type receptacle as shown for the equipment shall be provided by the electrical contractor. The available power shall be 208 volts / 1 phase / 60 Hz 30 amps on a dedicated circuit for the BME. The outlets must be located as shown or no more than 25 metres apart. The voltage drop must not exceed 3% of the nominal voltage for interruption free operation of the hoist motors. – By Electrical

1.2.2 Fresh Water Supply (hot & cold mixed) on the roof. – by Mechanical

1.2.3 Concrete roof pavers on the roof and in storage area. – By Structure

1.2.4 Safety belt or body harness with a lanyard and other personal safety devices. By Users

1.2.5 Two way communication system from the roof to a manned station in the building. By Building Operations.

1.3 CODES AND REQUIREMENTS OF REGULATORY AGENCY:

1.3.1 All worked covered by this specification shall comply with the following standards:

1.3.1.2 Alberta Occupational Health & Safety Act & Regulation, General Safety Regulation, including part 9, (Alta. Reg. 448/83) with amendments up to and including Alberta Regulation 348/84.

1.3.1.3 CAN/CSA Z91-02 "Health and Safety Code for Suspended Platform Operations".

1.3.2 In addition to above the contractor shall comply with any and all other legal requirements, applicable codes and shall obtain any permit and approval from the jurisdictional authority to commission this equipment.

1.3.3 A design and installation certificates indicating compliance with above codes shall be issued by the equipment supplier after commissioning the equipment. These certificates shall bear Alberta P. Eng. Stamp.

1.3.4 Required tests shall be made in presence of the authorized representatives of such local authorities and owners.

1.4 COORDINATION:

1.4.1 The BME Contractor shall coordinate related work, installation and site conditions to ensure successful completion of work specified in this section.

1.5 PROTECTION:

1.5.1 Protect the building structures and its finishes from damage due to installation, testing and operation of the building maintenance systems.

1.5.2 Make good components or surfaces soiled or otherwise damaged in connection with the work of this section.

1.5.3 Design equipment to preclude damage to the building parapet, facades or any other element by stopping the motion that causes the damage. The facade shall be protected from platform or wire rope damage especially on all sloped areas.

1.6 QUALIFICATIONS:

1.6.1 Designer/Manufacturer of the BME must have a minimum 5 years experience in the design and construction of such systems.

1.7 SUBMITTALS:

1.7.1 Submit as per General Conditions and Contract documents.

1.7.2 Shop Drawings:

1.7.2.1 Submit Shop Drawings in accordance with Contract Documents.

1.7.2.2 Show fabrication and erection dimensions, arrangements that interface with the building and sectional views, necessary details, including complete information of loading and for making connections with others work, items supplied to be built into others work, kinds of material and finishes, tracks and location of machinery. Shop drawings shall be submitted for approval prior to fabrication with minimum number of four copies and one sepia.

1.7.2.3 Provide as installed wiring schematic showing logic circuit and connections to all equipment.
1.7.2.4 Show Engineer’s data, calculations and details to confirm compliance with codes and standards mentioned in separate section, local regulations and legal requirements. Include all safety factors and safety notes along with restrictive usage if applicable.

1.7.2.5 Shop drawings shall bear professional seal and signature of a registered engineer licensed in the province of Alberta.

1.7.2.6 As Built Drawings: With in four weeks of issuance of completion certificates, as built drawings shall be provided in accordance with contract documents.

1.7.3 Operation and Maintenance Manuals:

1.7.3.1 Provide Operation and Maintenance Manuals in accordance with General Condition or Contract Documents for inclusion in Works Record Documents as specified in contract documents.

1.7.3.2 Include complete written and illustrated instruction manuals relative to the care, adjustments and operation of all parts of the equipment, a complete description and listing of components, with recommended frequency of service and maintenance to ensure maximum efficiency, reliability and long life of the equipment.

1.7.3.3 A detailed emergency rescue procedure shall be delineated in a step by step manner for the operator. Such plan shall be affixed to an easily accessible part of the machine.

1.7.3.4 Furnish written instructions with diagrams as necessary for complete operation & use of the equipment including a step by step procedure for movement about the building.

1.7.4 Safety Log Book:

1.7.4.1 Supply safety log book for inspection, maintenance and routine service reports.

1.7.5 Samples:

1.7.5.1 Submit sample as requested by the Architect, if required.

1.8 ALTERNATE PROPOSALS:

1.8.1 The contractor may provide alternate window washing equipment system designed, fabricated and installed by the approved listed manufacturers. If alternate systems are to be provided, contractor must submit at owner’s request details of such systems within one week of Tender Closing to assist in overall tender evaluation.

1.8.2 Contractor shall provide all information on building maintenance equipment e.g. loads, safety devices and safety factors, power requirements, conceptual drawings with dimensions and operating parameters.

1.9 WARRANTY:

1.9.1 Provide a warranty for the equipment and installation to be free of defective material and faulty workmanship for a period of one (1) year from the warranty start date. Replacement or rework of such defects shall be carried out immediately at no cost to the Owner.

1.9.2 Equipment shall be in satisfactory working condition for a trial period of 30 days before the warranty period starts. During the 30 day trial period, no more than 4 down days will be allowed for maintenance. Exceeding the down time period will require the trial period to start all over again.
2 PRODUCTS:

2.1 ACCEPTABLE MANUFACTURER:

2.1.1 Suspended Stages Inc.
34 Enterprise Rd.
Rexdale, ON M9W 1C5
416-243-7179

2.1.2 Tractel Limited, Swingstage Division
1615 Warden Avenue,
Scarborough, Ontario M1R 2T3
Telephone: 416-298-8822

2.1.3 Winsafe Corp.
One Valleywood Drive, Unit 1,
Markham, Ontario L3R 5L9
Telephone: 905-474-9340

2.2 DESIGN REQUIREMENTS:

2.2.1 Design and locate Davits and Davit Sockets around the perimeter of the building as indicated on the architectural drawings to cover all exterior facades. Davits and Sockets must resist applied moment with 4:1 stability factor.

2.2.2 The equipment shall be specifically designed for this project, meeting the space restriction and within the loading criteria depicted on the drawings.

2.2.3 Notwithstanding the standards, the minimum safety factor for the critical structural members shall be equivalent to 4:1 based on ultimate strength and normal operating condition. The deflection shall be limited to 1/90 of the span. The safety factor for the HLL system is 2:1 based on fall arrest loads for TWO operators.

2.2.4 The Tie back/HLL posts must be design for 22 kN minimum capacity and/or higher capacity if the design detects based on ultimate strength of the material.

2.2.5 Verify site conditions and develop connection details to the structure based on requirements of this specification and drawings.

2.3 PLATFORM STABILIZATION SYSTEM DESIGN CRITERIA:

2.3.1 The platform stabilization is to be achieved through the angulation method of the suspension rope. (The platform / singleman platform is not in this contract.)

2.4 FINISHES:

2.4.1 All steel surfaces, except stainless steel shall be hot dipped galvanized. All aluminum surfaces shall be mill finish.

2.5 EQUIPMENT SUMMARY:

The building maintenance equipment system shall include but shall not be limited to the following:

Roof # 1:
2.5.1 Twenty Seven (27) Pedestals (hot dip galvanized steel) for Portable Socket. The pedestal must have “U” anchor for the attachment of the suspension line. There are TWO types of pedestal having different heights. The Pedestal will be used either with the Davit system with safety line attached to the “U” anchor for Window Cleaning. The pedestals are supply only and are to be embedded in the slab by others.

2.5.2 Twenty Seven (27) hot-dipped galvanized steel Tie Back/HLL posts. The posts are supply only and embedded by others in the slab.

2.5.3 One (1) Horizontal Lifeline Systems # 1 (190 m) c/w stainless steel wire rope, hot dip galvanized Ends and Intermediate Supports (embedded in concrete slab) and other miscellaneous components to make it a complete system. The system shall be used for fall restraint as well as fall protection e.g safety line attached to this system for suspended equipment.

2.5.4 Two (2) hot-dipped galvanised Portable Socket compatible with Pedestals in 2.5.1.

2.5.5 Two (2) tip up, rotatable, two-piece aluminum Heavy Duty davits (two booms and two high profile masts) with trolleys to clear high parapet and launch a descent rope system. See drawings for Davit Reach.

2.5.6 One (1) Low Profile aluminium Mast to work with booms and portable sockets described in 2.5.3 and 2.5.4.

2.5.7 One (1) davit erection system and winch assembly for mechanical raising of the davits.

Roof # 2:

2.5.8 Eleven (11) Pedestals (hot dip galvanized steel) for Portable Socket. The pedestal must have “U” anchor for the attachment of the suspension line. There are TWO types of pedestal having different heights. The Pedestal will be used either with the Davit system with safety line attached to the “U” anchor for Window Cleaning. The pedestals are supply only and are to be embedded in the slab by others.

2.5.9 Twelve (12) hot-dipped galvanized steel Tie Back/HLL posts. The posts are supply only and embedded by others in the slab.

2.5.10 One (1) Horizontal Lifeline Systems # 2 (65 m) c/w stainless steel wire rope, hot dip galvanized Ends and Intermediate Supports (embedded in the slab) and other miscellaneous components to make it a complete system. The system shall be used for fall restraint as well as fall protection e.g safety line attached to this system for suspended equipment.

Roof # 3:

2.5.11 Fourteen (14) hot-dipped galvanized steel Tie Back/HLL posts. The posts are welded to the steel structure by this contractor.
2.5.12 One (1) Horizontal Lifeline Systems # 3 (128 m) c/w stainless steel wire rope, hot dip galvanized Ends and Intermediate Supports (welded to steel by this contractor) and other miscellaneous components to make it a complete system. The system shall be used for fall restraint as well as fall protection e.g safety line attached to this system for suspended equipment.

Roof # 4:

2.5.13 Ten (10) Pedestals (hot dip galvanized steel) for Portable Socket. The pedestal must have "U" anchor for the attachment of the suspension line. The Pedestal will be used either with the Davit system with safety line attached to the "U" anchor for Window Cleaning. The pedestals are welded to steel structure by this contractor. The steel structure provided for this purpose is by others Refer to drawings.

2.5.14 Ten (10) hot-dipped galvanized steel Tie Back/HLL posts. The posts are welded to the steel structure by this contractor.

2.5.15 One (1) Horizontal Lifeline Systems # 4 (55 m) c/w stainless steel wire rope, hot dip galvanized Ends and Intermediate Supports (welded to steel by this contractor) and other miscellaneous components to make it a complete system. The system shall be used for fall restraint as well as fall protection e.g safety line attached to this system for suspended equipment.

Roof # 5:

2.5.16 Nine (9) Pedestals (hot dip galvanized steel) for Portable Socket. The pedestal must have "U" anchor for the attachment of the suspension line. The Pedestal will be used either with the Davit system with safety line attached to the "U" anchor for Window Cleaning. The pedestals are welded to steel structure by this contractor. The steel structure provided for this purpose is by others Refer to drawings. One pedestal is embedded in concrete on this roof.

2.5.17 Twelve (12) hot-dipped galvanized steel Tie Back/HLL posts. The posts are welded to the steel structure by this contractor.

2.5.18 One (1) Horizontal Lifeline Systems # 5 (75 m) c/w stainless steel wire rope, hot dip galvanized Ends and Intermediate Supports (welded to steel by this contractor) and other miscellaneous components to make it a complete system. The system shall be used for fall restraint as well as fall protection e.g safety line attached to this system for suspended equipment.

2.5.19 One (1) hot-dipped galvanised Portable Socket compatible with Pedestals.

2.5.20 One (1) tip up, rotatable, two-piece aluminum Low Profile Heavy Duty davits with trolley to clear high parapet and launch a descent rope system. See drawings for Davit Reach.

. Roof # 6:

2.5.21 Eight (8) hot-dipped galvanized steel Tie Back posts. The posts are welded to the steel structure by this contractor.

COMMON TO ALL ABOVE
2.5.22 A one (1) year warranty for the installation.

2.5.23 Any other miscellaneous items and components required to make a complete operational system and are not specifically mentioned herein.

2.6 SELF POWERED PLATFORM (N.I.C)

This platform shall be used with the davit system. The platform is supplied by the Owner.

OR

A rental platform meeting the CSA standard could be utilized for this purpose.

2.7 ROOF DAVITS AND PORTABLE SOCKETS

2.7.1 Provide two-piece, tip-up, mechanically raised, rotatable, aluminum davits with trolleys. The trolley work position, to provide the proper suspension line angulation at all platform drop locations, shall be marked on the davit suspension arms.

2.7.2 Davits shall be designed to allow workmen to mount the platform on the roof surface, raise the platform above the parapets or guard railings and then translate the platform outboard while standing in the platform.

2.7.3 The davits are to be provided with bearings and seals to prevent the entrance of moisture plus a means for relubrication.

2.7.4 Provide portable winch mechanism to assist in the raising of the davits.

2.7.4.1 The winches shall be mounted on a tip-up mast/boom assembly capable of being laid flat on the roof surface, and pinned to a companion socket mounted on the Davit sockets.

2.7.4.2 After raising the winch mast/boom assembly, it shall be secured by a second pin to hold it in its working position.

2.7.4.3 The winch assembly shall contain a ratchet and pawl assembly and a load brake to prevent free wheeling of the crank handle during the descent operation.

2.7.5 Davit sockets to be of a design to preclude the raising of the davits in any but the designated relationship in respect to the parapet. They shall be designed to preclude their disengagement when Davits are in place. Sockets shall be fabricated from carbon steel and hot-dipped galvanized after fabrication. The socket must have “U” anchor for the attachment of the independent safety line.

2.7.6 Bolts, with lock washer and nuts, and other hardware for fastening sockets to the pre-installed pedestals shall be stainless steel.

2.8 PEDESTALS FOR SOCKET:

2.8.1 Pedestal shall be made from structural steel material and shall be hot dipped galvanized and shall be compatible with the structure.

2.8.2 The pedestal shall be welded to the structure by BME contractor as specified.

2.8.3 The top plate of the pedestal shall be compatible with davit socket mounting.
2.8.4 The post cavity must be filled with foam insulation.

2.9 TIE BACK ANCHORS / HLL POSTS:

The Tie Back shall be designed to sustain 22kN force (ultimate) in any direction without failure based on the ultimate strength of the material. The Tie Backs shall have hot dip galvanized finish. The attachment loop must be 20 mm diameter with 50 mm inside spacing and shall be made from stainless steel. The Tie back is attached to the roof structure by means of field welds. The welds shall be designed by BME contractor and shall be installed by BME contractor. Refer to drawings for further detail. The bolts and hardware shall be stainless steel.

Refer to plans for the Tie Backs that are required to be embedded in concrete. The cast in place Tie backs are supply only and are to be embedded in the slab by others.

All Tie Backs must be filled with foam insulation.

3 EXECUTION:

3.1 PREPARATION:

3.1.1 Examine the work of other Sections where such work affects the work of this Section and report unsuitable conditions to the Contractor.

3.1.2 Field measure and provide all materials to suit filed conditions before commencing the installation.

3.2 INSTALLATION:

3.2.1 This contractor is responsible for installation of all equipment supplied under this section except for work specified elsewhere. Building Maintenance Equipment shall be installed by the manufacturer of the equipment or his authorised representative.

3.3 ADJUSTMENT, TESTING AND DEMONSTRATION:

3.3.1 After completion of the installation, perform the design live load and operational tests. The Davit, Socket and Pedestals must be tested before turning them over to the user. The Tie Back must be tested with a force of 11 kN and a certificate of test must be provided.

3.3.2 Allow one full day to conduct operational demonstration for the Owner/Owner’s representative and safety inspector after completion of the operational test described in 3.3.1. Upon completion of the work, leave all apparatus in proper adjustment and operation.

3.3.3 Repair or replace any components and correct all deficiencies observed as a result of above tests. Retest as requested by the Owner to assure proper installation.

3.3.4 The equipment shall be in satisfactory working condition for a trial period of 30 consecutive days before the warranty period starts.
3.4 TRAINING:

3.4.1 Provide competent instructors to train the employees of the Owner, or others as directed, who will be responsible for the care, adjustment and operation of the equipment. Instructor shall be available for not more than one 8 hour day after completion of installation to give adequate instructions. Forward a statement to the Owner, with the names of the personnel given the instructions and certifying that the instructions were furnished.

END OF SECTION