

99% REVIEW



PROJECT MANUAL

CITY OF WINNIPEG
PUBLIC WORKS EAST YARD COMPLEX

99% REVIEW



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99% REVIEW

City of Winnipeg
Design and Construction of the Public Works East Yard
Complex at the Former Elmwood/Nairn Landfill Site

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1.1 BID INTENT

- .1 The intent of the Bid Documents is to receive formal Bids for the provision of labour, supervision, material, equipment, and services necessary for construction of the Public Works East Yard as described and drawn on the attached Drawings and Specifications.
- .2 The Tenderer, by submitting this tender, agrees that this tender, and any part of this tender, is subject to the following conditions in addition to any other terms and conditions set out in these tender documents:
 - .1 The submission of this tender, the receipt of this tender by the Owner and the opening of this tender does not in any way constitute acceptance of this tender.
 - .2 This tender shall not be deemed in any way to be a unilateral contract. It is an offer by the Tenderer to the Owner to carry out the provisions as are set out in this tender (offer) which may be accepted or rejected by the Owner in the Owner's entire discretion.
 - .3 The acceptance of all or any part of this tender may only be made in writing by the Owner and must be delivered to the tenderer.
 - .4 The Owner, in their entire discretion, may reject or accept all or any part of this tender, or any of the tenders submitted under this tender call. The Owner is under no obligation whatsoever to accept the lowest or any tender.
- .3 This specification is broken into the internationally accepted 48-section format for convenience only. Sections do not necessarily define the scope of work for a particular trade. The Construction Manager is responsible to coordinate all Work of the Contract. Paragraph 1.1 "Related Work" is included in each section for convenience to bidders and may or may not refer to work to be performed by a given sub trade. The Consultant will not arbitrate trade responsibility disputes between the Construction Manager and the Subcontractors.
- .4 The scope of work for each trade shall be in accordance with the "Manitoba Trade Definitions", as published by the Winnipeg Construction Association. Refer to the "Trade Definitions" for trade responsibilities and be responsible for work applicable to their trade regardless of where it appears in the documents.

1.2 DUE DATE

- .1 Quotations are due on the date as per the Construction Manager's instructions.

1.3 SECURITY BONDING

- .1 A 50% performance bond is required by all sub trades if their bid is \$200,000.00 or greater.

1.4 SITE EXAMINATION

- .1 The bidder is encouraged to examine the project site; either personally or through a representative, before submitting a Bid, and shall be satisfied as to the nature and location of the Work, conditions at the site of the Work, the equipment and facilities needed preliminary to execution and during the execution of the Work, the means of access to the site, on-site accommodation, all necessary information as to risks, contingencies and circumstances which may effect the Bid, and all other matters which can in any way effect the Work. The Bidder is fully responsible for obtaining all information required for the preparation of the Bid.
- .2 Claims for additional costs will not be considered with respect to conditions, which would reasonably have been ascertained by an inspection of the site prior to the Bid Closing.
- .3 There will not be a mandatory contractors site meeting scheduled during the tender period.

1.5 OMISSIONS / DISCREPANCIES / INTERPRETATIONS

- .1 Bidders finding discrepancies or omissions in the Drawings or Specifications, or having doubts as to the meaning or intent thereof, or discover any conditions on site which in their opinion may affect the Work of the Contract, shall at once notify the Consultant who will, if necessary, send written instructions or explanation to all Bidders registered with

- the Consultant. If a written decision is not received before tender due date, Bidders must clearly state their interpretation on the Bid Form. Otherwise the Bids will be accepted to include the more expensive interpretation.
- .2 Oral interpretations made to any Bidder shall not constitute a modification of any provision of the Bid Documents.
 - .3 Bidders may, during the Bidding period, be advised by Addendum of any alterations to the Bid Documents. All such changes will become part of the Contract Documents.
 - .4 The Consultant will endeavour not to issue any Addenda later than (5) working days prior to the Bid Closing Date. Contractors are encouraged to review the bid documents the first week of the tender call.

1.6 BIDDING INFORMATION

- .1 All costs of bidding shall be paid by the Bidder.
- .2 The General Conditions of the Contract apply to Contractors and Sub-contractors alike for the duration of construction.
- .3 Submit the Bid on the company letterhead, or preprinted quotation form, or an original copy of the CCDC Document 10 Bid Form signed and sealed by authorized officers of the Corporation, Partnership, or Sole Proprietorship in an opaque envelope clearly identified with:
 - .1 Bidder' name.
 - .2 Project Title.
- .4 The date and time of bid submission will be verified by the Construction Manager. Bidders must be registered an in good standing with the Workers Compensation Board (WCB) of Manitoba and shall complete fully and submit the required clearances prior to final payment.
- .5 Amendments to a submitted Bid will be permitted if received in writing on or prior to the Bid Closing and if endorsed by the same party or parties who signed the Bid.
- .6 Facsimile submissions revisions to the Bid will be accepted and be included as part of a sealed tender package if received prior to the Closing Time. Facsimiles will only be accepted if a sealed tender is received by the Closing Time indicated on the Invitation to Bid, and the facsimile indicates a change to the tendered Stipulated Price. An original copy must also be mailed or delivered to the Construction Manager.
- .7 Quotations that are unsigned, improperly executed, incomplete, conditional, illegible, obscure, or which contain arithmetical errors, erasures, alterations or irregularities of any kind, at the discretion of the Consultant, may be rejected as informal.

1.7 WITHDRAWAL OF BIDS

- .1 Any bidder may withdraw his bid, either personally or by written request, at any time prior to the scheduled Bid Closing Time. No bidder may withdraw his bid, after bids have been opened, unless mutually agreed by the Owner.

1.8 DURATION OF OFFER

- .1 Bids shall remain open to acceptance by Owner and shall be irrevocable for a period of sixty (60) days after the Bid Closing Date.

1.9 COMMENCEMENT AND DURATION OF WORK

- .1 State in the Bid, the construction time required to complete the completion of the Work. The completion date in the Agreement shall be the construction time from a mutually agreed commencement date. The submission of a Bid shall constitute agreement on the part of the Subcontractor to achieve Total Completion of the Work prior to the completion date. The Owner shall take all steps necessary to protect his interests in the event of failure to comply on the part of the Subcontractor. The Owner anticipates the award of the Contract and to start actual site construction immediately following acceptance of the Quotation.
- .2 The Owner desire that the Work under this Contract be completed as quickly as possible and consideration will be given to time of completion when awarding the Contract.

1.10 COMPETENCY OF BIDDERS

- .1 Any Bidder may be required to furnish evidence, satisfactory to the Owner that the company has sufficient means and experience in types of work called for to assure completion of this Contract in a satisfactory manner.
- .2 If the Subcontractors do not comply with the above requirements and standards, the Owner reserves the right to retain the services of Subcontractors that meet the qualifications noted above.

1.11 UNIT PRICES, ALTERNATIVE PRICES, SEPARATE PRICES AND BREAKOUT PRICES

- .1 As a part of the Quotation, each bidder shall include with the Bid Form, bid supplements listing the Unit Prices, Alternative Prices, and Separate Prices, which are requested in the Bid Documents. Bids not indicating the Alternate, Separate and Unit Prices listed in the specification will be rejected as incomplete.

1.12 BIDDING PROCEDURE FOR PRODUCTS SPECIFIED

- .1 Bids shall be submitted based on the products and execution described in the Contract Documents or on Construction Manager approved equal products. The specification format is based on Standard of Acceptance. This means that the item specified by name of manufacturer, brand, trade name or by catalogue reference meets the specification in all respects regarding performance, quality of material and workmanship and is acceptable to the Construction Manager without qualification and shall be provided under the Contract unless changed by mutual consent. Where two or more selections have been named, choice will be optional with Contractor.
- .2 Approval of Unspecified Products:
 - .1 Requests for approval of products and execution, as Equal or Alternate to those called for in the proposed Contract Documents, shall be submitted in writing at least 6 (six) working days before subcontract closing, to the Construction Manager.
 - .2 Submit sufficient samples, product literature, photographs, and specifications to completely describe the products and execution proposed and to enable the Consultant to properly evaluate the proposal.
 - .3 Where it is impractical for the Construction Manager to make an evaluation of Equal product, an approval to bid as an Alternate will be granted with final decisions made after Bids close.
- .3 The Construction Manager reserves the right to accept or reject any proposed products and execution, and reserves the right to disclose or not to disclose reasons for such rejection.
- .4 In submission of Alternates to products or execution specified, Bidders shall include in the Bid all costs required for the Work to fully accommodate the Alternate, including Consultants drawing and co-ordination costs.
- .5 The Consultant at their discretion, may request a fee payment prior to the review of a submitted unspecified product.
- .6 Refer to General Project Instructions Section 01 00 02 for Substitutions after the Contract is executed.

1.13 TAXES

- .1 **FEDERAL GOODS AND SERVICES TAX (GST):**
The Bidder shall NOT include any amount in the Stipulated Price for the Goods and Services Tax (GST). Any amount to be levied in respect of the GST will be invoiced as a separate item on the request for progress payment submitted by the Contractor. The 5% GST levy will be paid to the Contractor in addition to the Stipulated Price contract amount for work performed under the Contract.
- .2 **PROVINCIAL SALES TAX (PST)**
All bids shall include the applicable Provincial Sales Tax, but shown as a separate line item for Provincial rebate-calculations by Manitoba Health.

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- .3 The Contractor will be responsible to assist and supply to the Owner, the amount of tax included in the project costs, for the Owners accounting, rebate purposes, or government audit.
- 1.14 **BUILDING PERMIT**
- .1 The Construction Manager shall apply and pay for the plans examination and Building Permit.
- .2 The Subcontractor shall apply and pay for all applicable construction deposits or local ordinances as require by law. Include such costs in the Quotation.
- 1.15 **INSURANCE**
- .1 The Subcontractor will be required to obtain and pay for the *Contractor General Liability Policy* (CCDC 101). The Construction Manager will obtain and pay for the *All Risks Property Policy* (CCDC 201) and wrap up liability insurance.
- 1.16 **SHOP DRAWINGS**
- .1 THE Bidding Contractors and Subcontractors are to refer to the Specification Sections for shop drawing submission requirements. The Construction Manager will limit shop drawing review to critical work and not all sections will have to submit shop drawings to the Construction Manager. Shop Drawings are still required by the Contractors to coordinate the construction work of the Contract.
- .2 Refer to Section 01 00 02 for submittal general instructions.
- 1.17 **CONSULTANT CONTACTS**
- .1 Contractors requiring clarification of the Contract Documents are asked to contact the Consultants as identified in Section 00 72 00 2.1 Definitions.
- 1.18 **PARTNERING**
- .1 The Owner and Construction Manager endorse the concept of all project individuals working together to prevent disputes, foster a cooperative bond to everyone's benefit, and facilitate the completion of a successful project.
- .2 Partnering is not a contract, but a recognition that every contract includes an implied covenant of good faith.

END OF SECTION

1.1 CONTRACT AGREEMENT

- .1 This Contract is subject to the Canadian Standard Construction document CCA L-1, (1995 Edition) 1994 Edition, modified as follows. The subcontractor will be required to execute this Agreement with the Construction Manager before becoming entitled to any progress payment.

2.1 DEFINITIONS

- .1 Wherever referred to within this Contract, the terms noted shall have the following meanings:
- | | |
|------------------------------|--|
| Owner: | City of Winnipeg |
| Construction Manager: | Ernst Hansch Construction Ltd |
| Architect/Consultant: | Affinity Architecture Inc. |
| Structural Engineer: | Frovich & Associates |
| Mechanical Engineer: | Nova 3 Consulting Engineers |
| Electrical Engineer: | Nova 3 Consulting Engineers |
| Civil Engineer: | Morrison Hershfield |
| LEED Consultant: | Mistecture Architecture Interiors |
| Sub-contractor or Sub trade: | The individual or firm that executes the Sub-contract. |

3.1 VALUATION OF CHANGES

- .1 Where changes in the Work are requested, the Subcontractor must provide with their quotation a detailed breakdown showing invoiced cost of materials, labour, equipment rentals, plus a total allowance for overhead and profit of 10%. No other claims for extra work or claims based on differences of interpretation will be considered.

4.1 PROGRESS PAYMENTS

- .1 Applications for monthly payments must be delivered to the Construction Manager no later than the 25th day of the month, to be eligible for payment for that month, and shall be submitted in the form of Standard Construction Document CCDC Form No. 15. For second and succeeding applications, a Statutory Declaration that all accounts due under the preceding monthly claim have been paid, is required.

5.1 HOLDBACK

- .1 A holdback in accordance with the Provincial Liens Act will be retained from each monthly claim, and this will not be due for payment until 40 days after Substantial Performance of the Project unless otherwise stated in the said Act.

6.1 CLOSEOUT

- .1 Before final payment is due, obtain and deliver to the Construction Manager, on demand, a complete list of all Sub-subcontractor or major material suppliers together with a Statutory Declaration that all workmen have been paid all sums due to them under this Contract, that all labour and employment standards have been met and a Letter of Clearance from the Provincial Workers compensation Board. No further payment will become due to any Subcontractor while a lien due to work under its Subcontract exists on the property title, and such Subcontractor is responsible for all costs related to removal of same.

7.1 LIABILITY INSURANCE

- .1 Liability Insurance called for in the Contract Agreement and CCDC 101 are required in the minimum amount of \$2,000,000.00 for any one occurrence unless this amount is specifically changed within the particular specification trade section. Each subcontractor shall submit an insurance certificate to the Construction Manager before being entitled to any progress payment. This certificate must show the amounts and risks covered, commencement and expiry dates, and must certify that 30 days advance notice will be given to the Construction Manager before cancellation or any change in coverage. Before

being entitled to final payment, the Subcontractor shall produce evidence that this liability insurance is and will remain in force until the end of the Warranty period.

8.1 **PROPERTY INSURANCE**

- .1 All-Risk Property Insurance as called for in the Contract Agreement and CCDC 201 will be provided by the Construction Manager, covering the whole project, in the name of the Owner, Construction Manager, Consultant and all Subcontractors as their interest may appear, subject to a deductible amount of \$2,500.00. In the event of a claim, an amount up to this \$2,500.00 may be assessed against any Subcontractor as its interests and responsibility may appear. The Construction Manager and each Subcontractor are each responsible for their own plant, equipment and tools, and for all materials not yet accepted at the site or incorporated into the Work, and for all insurance coverage of same.

9.1 **WORK NOT IN CONTRACT**

- .1 Work, material or equipment indicated as being provided by the Owner and noted 'N.I.C' on the drawings will be at the cost of the Owner except for coordination, wiring and connection which will be performed by the Subcontractors and the cost included in their Contract.

END OF SECTION

1.1 GENERAL INSTRUCTIONS

- .1 Application of this Section:
 - .1 This section is an integral part of each Subcontract entered into with the Construction Manager for this Project, and shall be read with each section as applying to the work of each trade unless specifically noted to be excluded.
- .2 Codes and Standards:
 - .1 Execute the Work in accordance with the latest edition of the Manitoba Building Code, NBC and Supplements and all Codes as well as Standards specified within the text of this specification. The drawings and specifications do not create any release from compliance with governing Codes and Standards.
- .3 Coordination and Cooperation:
 - .1 Coordinate all work and workers to ensure that the requirements of this Contract are executed expeditiously. A competent superintendent is required while work is in progress.
 - .2 Each trade contractor is responsible for layout of his own work and to see that his work comes together with that of others required.
 - .3 Hoisting materials is the responsibility of the Subcontractor involved unless specifically noted otherwise.
- .4 Drawing and Design Conformance:
 - .1 All trades must assure themselves that they have the latest drawings. Check dimensions on job before fabrication. Report all discrepancies on drawings.
- .5 Weather-Proofing:
 - .1 The Sub-Contractor will be responsible to provide a weather-proof building envelope upon completion of the Contract Work. If the Sub-Contractor feels the Consultant's details will not provide a weather-proof envelope, notification must be given in writing prior to commencement of the Work. No notification constitutes acceptance of the Consultant's design.
- .6 Performance:
 - .1 Execute the work with all possible speed consistent with good workmanship. Organize the ordering of materials and subcontractor's work and coordinate same so that delays will be avoided. Each trade must assure that adequate manpower is provided on site to meet construction scheduling.
- .7 Insurance:
 - .1 The Subcontractor shall maintain Contractor liability insurance with limits of not less than two million dollars and the Owner will provide Builders All Risk insurance.
 - .2 Each Subcontractor shall maintain Contractor liability insurance with limits not less than two million dollars and insurance for all vehicles used in connection with the Work.

2.1 JOB PROGRESS MEETINGS

- .1 Job meetings: Construction Manager will call project meetings and assume responsibility for setting times and recording and distributing minutes.

3.1 SUBMITTALS

- .1 Shop Drawings:
 - .1 Each Subcontractor shall prepare and review all shop drawings prior to their submission to the Construction Manager. This review represents that all requirements have been determined and verified, or will be, and that each shop drawing has been checked and coordinated with the requirements of the work and the Contract. Contractor proposed substitutions to the material or design will not be permitted without prior written approval from the Consultant before the bids close.
 - .2 Fifteen (15) days prior to Substantial Performance, submit marked-up prints of record document and Operation and Maintenance Manuals to Construction Manager. After final acceptance by Construction Manager, correct sepia

- drawings for as-built record and submit them to the Construction Manager for approval.
- .3 Unsatisfactory as-built drawings and Operating Maintenance Manuals will be treated as a deficiency.

4.1 QUALITY CONTROL

- .1 Inspection and Testing of Work:
 - .1 Independent inspection and testing agencies approved by the Construction Manager shall be engaged for the purpose of inspections and/or testing portions of Work. All costs of such services will be borne by the Owner.
 - .2 Employment of inspection and testing agencies does not relax the responsibility to perform Work in accordance with the Contract Documents.
 - .3 Allow the inspection/testing agencies access to all portions of Work and manufacture and/or fabrication plants. Cooperate to provide for such access.
 - .4 Notify the Consultant three working days in advance of the requirement for a site review, test or inspection.
 - .5 Submit samples and/or materials required for testing, as specifically requested in specifications. Submit with reasonable promptness and in an orderly sequence so as to cause no delay in the Work.
 - .6 If defects are revealed during inspection and/or testing, the inspection/testing agency will request additional inspection and/or testing to ascertain full degree of defect. Correct defects and irregularities as advised by the consultant, at no cost to the Owner. Subcontractor to pay all costs for re-testing and re-inspection.
- .2 References Standards:
 - .1 Within the text of the specifications, reference is made to various standards for which products and/or systems are to conform. Conform to these standards in whole; or in part as specifically requested in the specifications.
 - .2 If there is question as to whether any product or system is in conformance with applicable standards; the Consultant reserves the right to have such products or systems tested at the expense of the Supplier in order to verify their conformance.

5.1 TEMPORARY FACILITIES

- .1 Site Office:
 - .1 The Construction Manager will provide and maintain adequately lighted, heated and ventilated office with space for filing and layout of Contract Documents and regulatory documents, as require for their own use only.
 - .2 Each trade shall provide and maintain in a clean and orderly condition, lockable areas for storage of tools, equipment and material requiring protection. Storage of tools, other than in construction area, will not be permitted.
- .2 Utilities:
 - .1 The Construction Manager will provide sufficient sanitary facilities for workers.
 - .2 The Construction Manager will arrange for a continuous supply of potable water for construction use at one location adjacent to the Work. Subcontractors shall supply their own distribution system from that supply and take full responsibility for its maintenance and any damage resulting from leakages or otherwise.
 - .3 Each Subcontractor is responsible to ensure that adequate temporary heat is provided is provided to prevent damage to their Work or the existing building.
 - .4 The Construction Manager will provide and pay for all temporary power required during construction at a designated location. Each Subcontractor must supply his own flexible leads from these points.
 - .5 The Construction Manager will provide, pay for and maintain temporary lighting throughout the project to comply with local authorities' safety regulations.
 - .6 The Construction Manager will provide and pay for temporary telephones necessary for use of Subcontractors, in site office, but each Subcontractor shall pay for his own long distance call charges.

- .3 Construction Aids:
 - .1 Each Subcontractor shall provide dust-tight screens or partitions as may be required to localize dust generating activities and for the protection of his workers, finished areas of work and the public.
- .4 Protection of Work and Property:
 - .1 Provide temporary fences for protection of adjacent property from damage during the performance of Work as required by local authorities, except for below grade work where protection will be the responsibility of Subcontractor concerned. If such fences are damaged, cost of repair will be charged to the Subcontractor responsible.
 - .2 Each Subcontractor shall provide adequate protection for finished and partially finished building and equipment during the performance of his Work until it is accepted by the Consultant as completed.

6.1 PRODUCTS/WORKMANSHIP

- .1 Quality of Products:
 - .1 All materials, equipment and articles incorporated in the Work shall be new, not damaged or defective, and of the best quality for the purpose intended.
 - .2 Should any dispute arise as to the quality or fitness of materials, equipment or articles, the decision rests strictly with the Consultant based upon the requirements of the Contract Documents.
- .2 Availability of Products:
 - .1 Immediately upon signing Contract, review product delivery requirements and anticipate foreseeable supply delays. If delays in supply of material, equipment or articles are foreseeable, notify the Consultant of such, in order that substitutions or other remedial actions may be authorized in ample time to prevent delay in performance of Work.
- .3 Storage, Handling and Protection of Products:
 - .1 Handle and store products in a manner to prevent damage, adulteration, deterioration and soiling and in accordance with manufacturer's recommendations when applicable.
 - .2 Products subject to damage from weather shall be stored in weatherproof enclosures, provided by Subcontractor.
 - .3 Store cementitious materials clear of earth or concrete floors, and away from walls.
 - .4 When construction is sufficiently advanced, Construction Manager may designate storage space within the building. Any shifting of materials so stored, if required by the Construction Manager, shall be at Subcontractor's expense.
 - .5 Remove and replace damaged products at own expense and to the satisfaction of the Construction Manager.
 - .6 Where any materials are purchased by the Owner, for installation by Subcontractor, and are specified, "F.O.B. job site", the Subcontractor involved is responsible to see that such are received in undamaged condition, and to settle all damage claims against the carriers.
 - .7 Any materials supplied for installation by trade contractors will be delivered F.O.B. job site. Placing in designated storage areas, distribution throughout the project and hoisting is by the Subcontractor installing same.
- .4 Manufacturer's Direction
 - .1 Unless otherwise indicated in the specifications, install or erect all products in accordance with manufacturer's recommendations. Do not rely on labels or enclosures provided with products. Obtain instructions directly from manufacturers.
 - .2 Notify the Construction Manager in writing, of any conflicts between the specifications and manufacturer's instructions, at time of bidding.
- .5 Workmanship:
 - .1 Workmanship is to be of the best quality, executed by workers experienced and skilled in the respective duties for which they are employed.
 - .2 At all times enforce discipline and good order among workers.

- .6 Concealment and Location of Fixtures:
 - .1 In finished areas conceal all pipes, ducts and wiring in floors, walls and/or ceilings, except where indicated otherwise on drawings or in specifications.
 - .2 Before installation, inform the Construction Manager if there is a contradictory situation. Install as directed.
 - .3 Confirm the location of fixtures, outlets and other mechanical and electrical items which are indicated on drawings. Coordinate their location with other trades so that all materials will fit into the spaces allowed.
- .7 Cutting and Remedial Work:
 - .1 Perform all cutting and remedial work that may be required to make several parts of Work come together properly. Coordinate the schedule for Work to ensure that cutting and remedial work is minimized.
 - .2 Perform cutting and remedial work by specialist familiar with the materials affected. Perform in a manner to neither damage nor endanger any portion of Work. The subcontractor requiring openings shall arrange and pay for cutting.
- .8 Fastenings:
 - .1 Provide metal fastenings and accessories in same texture, colour and finish as adjacent material, unless otherwise indicated in specifications.
 - .2 Prevent electrolytic action between dissimilar metals and materials.
 - .3 Use non corrosive hot dip galvanized fasteners and unless stainless steel or other material is specifically requested in the affected specification section.
 - .4 Space anchors within their load limit or shear capacity and ensure they provide positive permanent anchorage. Wood, or any other organic material plugs are not acceptable.
 - .5 Keep exposed fastenings to a minimum, space evenly and install neatly.
 - .6 Fastenings which cause spalling or cracking of material to which anchorage is made are not acceptable.
- .9 Protection of Work in Progress:
 - .1 Adequately protect all work completed or in progress. Any work damaged or defaced due to failure in providing such protection is to be removed and replaced, or repaired, as directed by the Consultant.
 - .2 Prevent overloading of any part of the building. Do not cut, drill or otherwise sleeve any load bearing structural member, unless indicated specifically on drawings or in specifications, without written approval of the Construction Manager.
- .10 Existing Utilities:
 - .1 When breaking into or connecting to existing services or utilities, carry out work at times directed by the Owner. Notify the Owner 48 hours in advance of any disruption in existing services.

7.1 PROJECT CLEAN-UP

- .1 Clean-up and Final Cleaning of Work:
 - .1 Each Subcontractor shall remove all waste materials and debris due to his work from the building and the site at regular scheduled times, or dispose of as otherwise directed by the Construction Manager. Do not burn waste materials on site. Subcontractors not complying with these requirements will have costs of such work levied against the.
 - .2 Remove stains, marks and dirt from all surfaces of the Work and present same in acceptable condition for Construction Manager approval.
- .2 Removal of Temporary Facilities:
 - .1 On completion of project, each Subcontractor shall remove all temporary office and furniture, hoarding, fencing and all other items provided by him.
- .3 Environmental Cleaning:
 - .1 Public roadways are to be cleaned of excavation debris or demolition material before the end of the construction day.

- .2 Neighbouring properties are to be cleaned immediately if construction debris is deposited on site areas.

8.1 TAKE OVER PROCEDURES/CONTRACT CLOSEOUT

- .1 Instructions to Owner's Personnel:
 - .1 In addition to start-up supervision and certification of equipment, instruct Owner's personnel in operation and maintenance of all equipment and systems.
 - .2 Review instructions with Owner's representative to ensure a thorough understanding of equipment and its operation.
 - .3 Turn over all keys by certified delivery or in person.
- .2 Inspection:
 - .1 Prior to application for Certificate of Substantial Performance, the Subcontractor shall carefully inspect his Work and ensure that construction deficiencies are corrected and that his Work is clean and in condition for use. Notify the Construction Manager in writing, of satisfactory completion and request Consultant Inspection. Each trade contractor is responsible to obtain the required inspections and certifications of their installation by all required authorities as needed to obtain partial or complete occupancy certificates, and to include any necessary costs for same.
- .3 Deficiencies:
 - .1 During Construction Manager's review, a list of deficiencies and defects, not in accordance with the Contract Documents will be complied and sufficient funds, in the judgement of the Construction Manager will be withheld from payment requested to ensure that any deficiencies certified by the Construction Manager can be completed satisfactorily.
 - .2 The Subcontractors shall then proceed to correct the deficiencies, and complete the Work of the Contract within (30) days. If the Work is not completed with the thirty (30) days, the Owner, at their discretion, will retain others to complete the Work and cost will be deducted from the Subcontractors final payment.
 - .3 Consultant inspections after Total Completion, will be invoiced to Subcontractor at \$100.00/hr. plus expenses.

9.1 WARRANTY

- .1 Warranty period commences on the date of Substantial Performance and shall remain in effect for a period of one year.
- .2 During warranty period, Subcontractors are contractually obligated to rectify at their expense, any Work deficient or unsatisfactory, including drywall cracking, within 30 days of notification by the Owner.
- .3 A Year End Warranty Inspection will be held with the Owner, and Construction Manager. Deficiencies will be recorded and submitted for distribution to Subcontractors involved. Work must be corrected within 30 days of notification or the Subcontractor will be in breach of contract responsibilities and subject to recovery of costs incurred by the Owner to rectify defects.

END OF SECTION

1.1 GENERAL INSTRUCTIONS

- .1 Submittals shall be sent to the Construction Manager. The Contractor may submit shop drawings directly to the respective Engineering Consultants with a copy to the Construction Manager if immediate review is required.
- .2 Until the submission is reviewed; the Work involving relevant products must not proceed.
- .3 Corrections or comments made on the submittals during the Construction Manager's review do not relieve the Contractor from compliance with the requirements of the drawings and specifications. This procedure is only for review of the general conformance with the design concept of the project and general compliance with the information given in the Contract Documents. The Contractor is responsible for confirming and correlating all quantities and dimensions; selecting fabrication processes and techniques of construction; coordinating his or her work with that of all other trades; and performing all work in a safe and satisfactory manner.
- .4 Refer to each Specification Section to determine if a shop drawing submittal is required in accordance with Section 01 00 02.

2.1 CO-ORDINATION OF SUBMISSIONS

- .1 Review and correct shop drawings, product data and samples prior to their submission.
- .2 Verify:
 - .1 Field measurements and dimensions shop drawing accordingly.
 - .2 Field construction to suit new work.
 - .3 Catalogue numbers and similar data.
- .3 Coordinate each submission with the requirements of the Work and the Contract Documents. Individual shop drawings will not be reviewed until all related shop drawings are available to the Consultant.
- .4 The Contractor's responsibility for deviations in submission from requirements of the Contract Documents is not relieved by Consultant's review of the submission, unless the Consultant gives written acceptance of deviations.
- .5 After Consultant's review, distribute copies to Sub-contractors and the site.

3.1 SUBMISSION REQUIREMENTS

- .1 Schedule submissions at least 45 working days before the reviewed submissions will be needed. The Construction Manager requires 30 days to review all submittals.
- .2 Submit 6 prints OR 1 Electronic PDF copy of shop drawings for each requirement requested in specification Sections and as Construction Manager may reasonably request.
- .3 Submit 6 copies OR 1 Electronic PDF copy of product data sheets or brochures for requirements requested in specification Sections and as requested by Construction Manager where shop drawings will not be prepared due to standardized manufacture of product.
- .4 Submit 6 copies OR 1 Electronic PDF copy of test reports for requirements requested in specification Sections and as requested by Construction Manager.
 - .1 Report signed by authorized official of testing laboratory that material, product or system identical to material, product or system to be provided has been tested in accord with specified requirements.
- .5 Submit 6 copies OR 1 Electronic PDF copy of certificates for requirements requested in specification Sections and as requested by Construction Manager.
 - .1 Statements printed on manufacturer's letterhead and signed by responsible officials of manufacturer of product, system or material attesting that product, system or material meets specification requirements. Delete information not applicable to project.
- .6 Submit 6 copies OR 1 Electronic PDF copy of manufacturers instructions for requirements requested in specification Sections and as requested by Construction Manager.
 - .1 Pre-printed material describing installation of product, system or material, including special notices and Material Safety Data Sheets concerning impedances, hazards and safety precautions.

- .7 Submit 6 copies OR 1 Electronic PDF copy of Manufacturer's Field Reports for requirements requested in specification Sections and as requested by Construction Manager.
 - .1 Documentation of the testing and verification actions taken by manufacturer's representative to confirm compliance with manufacturer's standards or instructions.
- .8 Submit 6 copies OR 1 Electronic PDF copy of Operation and Maintenance Data for requirements requested in specification Sections and as requested by Construction Manager.
- .9 Supplement standard information to provide details applicable to project.
- .10 Accompany submissions with a transmittal letter, noting:
 - .1 Project title
 - .2 Contractor's name and address.
 - .3 Description of each shop drawing, product data and sample submitted.
 - .4 Drawings and Brochures shall include:
 - .5 Date and revision dates.
 - .6 Project title.
 - .7 Name of: Contractor, Subcontractor, Supplier, manufacturer.
 - .8 Identification of product and materials.
 - .9 Relation to adjacent structure or materials.
 - .10 Field dimensions, clearly identified as such.
 - .11 Specification Section number.
 - .12 Applicable standards, such as CSA or CGSB numbers.
 - .13 Contractor's stamp, signed, certifying review of submission, verification of field measurements and compliance with Contract documents, per GC 3.11.

4.1 SAMPLES

- .1 Submit samples in sizes and quantities specified.
- .2 Where colour, pattern or texture is criterion, submit full range of samples.
- .3 Submit samples with reasonable promptness and in an orderly sequence, so as to cause no delay in the work. Failure to submit samples in ample time is not to be considered sufficient reason for an extension of contract time and no claim for extension by reason of such default will be allowed.
- .4 Notify the Consultant in writing, at the time of submission, of any deviations in samples from the requirements of the Contract Documents.
- .5 The Construction Manager's review will be for conformity of design concept and quality of materials.
- .6 Any adjustments made to samples by the Construction Manager are not intended to change the Contract Price. If it is deemed that such adjustments affect the value of Work, clearly state so in writing prior to proceeding with the Work.

5.1 PRODUCT DATA

- .1 Certain Specification Sections specify that manufacturer's standard schematic drawings, catalogue sheets, diagrams, schedules, performance charts, illustrations and other standard descriptive data will be accepted in lieu of shop drawings.
- .2 The above will only be accepted if they conform to the following:
 - .1 Delete information which is not applicable to the project.
 - .2 Supplement standard information to provide additional information applicable.
 - .3 Show dimensions and clearances required.
 - .4 Show performance characteristics and capacities.
 - .5 Show wiring diagrams (when requested) and controls.

6.1 SHOP DRAWINGS

- .1 Drawings shall be originals prepared by the Contractor, Sub-contractor, Supplier or Distributor, which illustrate the appropriate portion of the work, showing fabrication, layout, setting or erection details as specified in appropriate sections.

- .2 Identify details by reference to sheet and detail numbers shown on the Contract Drawings.
- .3 Maximum sheet size 600 x 900 mm, (24" x 36").

END OF SECTION

1.1 SCOPE OF WORK

- .1 Requirements for Inspection and testing, which are to be carried out by a testing laboratory, are specified under Related Work sections of this specification.
- .2 The Consultants have been retained by the Construction Manager to ensure compliance with the design and contract documents. Periodic construction review will be carried out by all disciplines.
- .3 Testing laboratories and inspection authorities for all specified sections shall be appointed by the Construction Manager on behalf of the Owner.

1.2 TESTING COST AND PAYMENT

- .1 Inspection and testing costs will be paid by the Construction Manager charged against the CASH ALLOWANCE provided for in the Stipulated Price Contract amount, when called for by the Construction Manager on behalf of the Owner.
- .2 The Contractor shall pay the cost of:
 - .1 Inspections and testing required by laws, ordinances, rules, regulations or order of public authorities.
 - .2 Inspections and testing performed exclusively for Contractor's convenience or to confirm a Contractor projected alternate method of construction.
 - .3 Testing, adjustment and balancing of conveying systems, mechanical and electrical equipment and systems.
 - .4 Mill tests and certificates of compliance.
 - .5 Tests ordered to be carried out by Contractor under the supervision of Construction Manager, when material is suspected to not meet the specified design standards.
- .3 Where tests or inspections by the designated testing laboratory reveal work not in accordance with Contract requirements, the Contractor shall pay the costs for additional tests or inspections, as the Construction Manager may require, in order to verify the acceptability of the corrected work.
- .4 Costs of all special tests, inspections, or approvals not so itemized and called for by the Owner will be charged in accordance with the contract provisions for Changes in the Work.

1.3 CONTRACTOR'S RESPONSIBILITY

- .1 Furnish labour and facilities to:
 - .1 Provide access to the work to be inspected and tested.
 - .2 Facilitate inspections and tests.
 - .3 Make good any work that was disturbed by the inspection and test.
 - .4 Provide storage on site for a testing laboratory's exclusive use to store equipment and cure test samples.
- .2 Notify the Construction Manager sufficiently in advance of operations to allow for the assignment of laboratory personnel and for the scheduling of tests.
- .3 Where materials are specified to be tested, deliver representative samples in required quantity to the designated testing laboratory.
- .4 Pay costs for uncovering and making good any work that is covered before required inspections or testing are completed.

END OF SECTION

1.1 QUALITY OF PRODUCTS

- .1 All materials, equipment and articles incorporated in the Work shall be new, not damaged or defective, and of the best quality for the purpose intended. Defective materials, whenever found, will be ordered replaced at the Contractor's expense.
- .2 Should any dispute arise as to the quality or fitness of materials, equipment or articles, the decision rests strictly with the Consultant based upon the requirements of the Contract Documents.
- .3 Unless otherwise indicated in the specifications, maintain uniformity of manufacture for any particular or like item throughout the building and have replacement parts readily available.
- .4 Permanent labels, trademarks and nameplates on materials, equipment and articles are not acceptable in prominent locations, except where required for operating instructions, and when located in mechanical or electrical rooms.
- .5 Restricted Materials
 - .1 Refer to recommended material schedule at the end of this section.
 - .2 Confirm that the products specified or proposed for use conform to the recommendations for best use.

2.1 AVAILABILITY OF PRODUCTS

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

3.1 STORAGE, HANDLING AND PROTECTION OF PRODUCTS

- .1 Handle and store products in a manner to prevent damage, adulteration, deterioration and soiling and in accordance with manufacturers' recommendations when applicable. Do not remove labels or packaging until required in the Work.
- .2 Products subject to damage from weather shall be stored in weatherproof enclosures, provided by the Contractor.
- .3 Store cementitious materials clear of earth or concrete floors, and away from walls. Store sand on wooden platforms and cover it with tarpaulins.
- .4 When construction is sufficiently advanced, the Construction Manager may designate storage space within the building. Any shifting of materials so stored, if required by the Construction Manager, shall be at Contractor's expense.
- .5 Remove and replace damaged products to the satisfaction of the Construction Manager.
- .6 Where any materials are purchased by the Owner, for installation by the Contractor, and are delivered F.O.B. job site, the Contractor is responsible to confirm that materials are; received in undamaged condition, unloaded and stored where directed by the Owner at no additional cost to the Contract.
- .7 Damage claims for any product delivered to the job site are to be settled by the Contractor directly with the carrier.

4.1 MANUFACTURER'S INSTRUCTIONS

- .1 Unless otherwise indicated in the specifications, install or erect all products in accordance with manufacturer's recommendations. Do not rely on labels or enclosures provided with products. Obtain instructions directly from manufacturers.
- .2 Notify the Construction Manager in writing, of any conflicts between the specifications and manufacturer's instructions, at time of bidding.

- .3 Improper installation or erection of products due to failure to comply with these requirements authorizes the Construction Manager to require any removal and re-installation that may be considered necessary, at no increase in the Contract Price.

5.1 WORKMANSHIP

- .1 Workmanship is to be of the best quality, executed by workers experienced and skilled in the respective duties for which they are employed. Notify the Construction Manager if the work detailed is impractical to produce the desired results to craftsman standards.
- .2 At all time, enforce discipline and good order among workers. Do not employ any unfit person or any one unskilled in the duties assigned to him. The Construction Manager reserves the right to require the dismissal of workers deemed incompetent, careless, insubordinate or otherwise objectionable.

6.1 CONCEALMENT AND LOCATION OF FIXTURES

- .1 In finished areas, conceal all pipes, ducts and wiring in floors, walls and ceilings, except where indicated otherwise on drawings or in specifications.
- .2 Before installation, inform the Consultant if there is a contradictory situation. Install as directed.

7.1 LOCATION OF EQUIPMENT AND FIXTURES

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

8.1 CUTTING AND REMEDIAL WORK

- .1 Perform all cutting and remedial work that may be required to make several parts of Work come together properly. Coordinate the schedule for Work to ensure that this requirement is maintained to a minimum.
- .2 Perform cutting and remedial work by specialists familiar with the materials affected. Perform in a manner to neither damage nor endanger any portion of the Work.

9.1 FASTENINGS

- .1 Provide metal fastenings and accessories in the same texture, colour and finish as adjacent material, unless otherwise indicated in specifications.
- .2 Prevent electrolytic action between dissimilar metals and materials.
- .3 Use non-corrosive hot dip galvanized fasteners unless stainless steel or other material is specifically requested in the affected specification section.
- .4 Space anchors within their load limit or shear capacity and ensure that they provide positive permanent anchorage. Wood, or any other organic material plugs are not acceptable.
- .5 Keep exposed fastenings to a minimum, space evenly and install neatly. Confirm fastener type with the Construction Manager prior to installation.
- .6 Obtain the Construction Manager's approval before using explosive actuated fastening devices. If approval is obtained, comply with CSA Z166-1975.
- .7 The Contractor is responsible to obtain the manufacture's recommendation on the design, strength, sizing, location and installation methods of all mechanical fasteners used in the Work.
- .8 Bolts may not project more than one diameter beyond nuts.
- .9 Stainless steel exterior fasteners to be No. 34 stainless steel.

- .10 Use plain type washers on equipment, sheet metal and soft gasket lock type washers where vibration occurs. Use stainless steel washers with stainless steel fasteners.

10.1 PROTECTION OF WORK IN PROGRESS

- .1 Adequately protect all work completed or in progress. Any Work damaged or defaced due to failure in providing such protection is to be removed and replaced, or repaired, as directed by the Construction Manager and at no increase in the Contract Price.
- .2 Prevent overloading of any part of the building. Do not cut, drill or otherwise sleeve any load bearing structural member, unless indicated specifically on drawings or in specifications, without written approval of the Construction Manager.

11.1 EXISTING UTILITIES

- .1 When breaking into or connecting to existing services or utilities, carry out work at times directed by local governing authorities, with a minimum of disturbance to the Work and pedestrian and vehicular traffic. Refer also to Construction Management Specifications Section 01 00 02.

12.1 CONSTRUCTION EQUIPMENT AND PLANT

- .1 On request, prove to the satisfaction of the Construction Manager, that the construction equipment and plant are adequate to manufacture, transport, place and finish work to the quality and production rates required. If inadequate, replace or provide additional equipment or plant as directed.
- .2 Maintain construction equipment and plant in good operating order.

END OF SECTION

Part 1 General

1.1 PROJECT CLEANLINESS

- .1 Maintain Work in tidy condition, free from accumulation of waste products and debris.
- .2 Remove waste materials from site at regularly scheduled times or dispose of as directed by Construction Manager. Do not burn waste materials on site.
- .3 Clear snow and ice from access to building, bank/pile snow in designated areas only or remove from site as directed by Construction Manager.
- .4 Make arrangements with and obtain permits from authorities having jurisdiction for disposal of waste and debris.
- .5 Provide on-site containers for collection of waste materials and debris.
- .6 Remove waste material and debris from site and deposit in waste container at end of each working day.
- .7 Dispose of waste materials and debris off site.
- .8 Clean interior areas prior to start of finish work, and maintain areas free of dust and other contaminants during finishing operations.
- .9 Store volatile waste in covered metal containers, and remove from premises at end of each working day.
- .10 Provide adequate ventilation during use of volatile or noxious substances. Use of building ventilation systems is not permitted for this purpose.
- .11 Use only cleaning materials recommended by manufacturer of surface to be cleaned, and as recommended by cleaning material manufacturer.
- .12 Schedule cleaning operations so that resulting dust, debris and other contaminants will not fall on wet, newly painted surfaces nor contaminate building systems.

1.2 FINAL CLEANING

- .1 When Work is Substantially Performed, remove surplus products, tools, construction machinery and equipment not required for performance of remaining Work.
- .2 Remove waste products and debris other than that caused by others, and leave Work clean and suitable for occupancy.
- .3 Prior to final review, remove surplus products, tools, construction machinery and equipment.
- .4 Remove stains, spots, marks and dirt from work.
- .5 Clean lighting reflectors, lenses, and other lighting surfaces.
- .6 Inspect finishes, fitments and equipment and ensure specified workmanship and operation.
- .7 Broom clean and wash exterior walks, steps and surfaces; rake clean other surfaces of grounds.
- .8 Remove dirt and other disfiguration from exterior surfaces.
- .9 Clean and sweep roofs, gutters, areaways, and sunken wells.
- .10 Sweep and wash clean paved areas.
- .11 Clean equipment and fixtures.
- .12 Clean roofs, downspouts, and drainage systems.
- .13 Remove debris and surplus materials from crawl areas and other accessible concealed spaces.
- .14 Remove snow and ice from access to building.

1.3 WASTE MANAGEMENT AND DISPOSAL

- .1 Separate waste materials for reuse and recycling in accordance with Section 01 74 21 - Construction/Demolition Waste Management And Disposal Products .

END OF SECTION

Part 1 General

1.1 SUBMISSION

- .1 Prepare instructions and data using personnel experienced in maintenance and operation of described products.
- .2 Copy will be returned after final inspection, with Construction Manager's comments.
- .3 Revise content of documents as required prior to final submittal.
- .4 Two weeks prior to Substantial Performance of the Work, submit to the Construction Manager four final copies of operating and maintenance manuals in English.
- .5 Ensure spare parts, maintenance materials and special tools provided are new, undamaged or defective, and of same quality and manufacture as products provided in Work.
- .6 If requested, furnish evidence as to type, source and quality of products provided.
- .7 Defective products will be rejected, regardless of previous inspections. Replace products at own expense.
- .8 Pay costs of transportation.

1.2 FORMAT

- .1 Organize data in the form of an instructional manual.
- .2 Binders: vinyl, hard covered, 3 'D' ring, loose leaf 219 x 279 mm with spine and face pockets.
- .3 When multiple binders are used, correlate data into related consistent groupings. Identify contents of each binder on spine.
- .4 Cover: Identify each binder with type or printed title 'Project Record Documents'; list title of project and identify subject matter of contents.
- .5 Arrange content by systems under Section numbers and sequence of Table of Contents.
- .6 Provide tabbed fly leaf for each separate product and system, with typed description of product and major component parts of equipment.
- .7 Text: Manufacturer's printed data, or typewritten data.
- .8 Drawings: provide with reinforced punched binder tab. Bind in with text; fold larger drawings to size of text pages.
- .9 Provide 1:1 scaled CAD files (AutoCAD 2010 or higher) in drawing format on CD.

1.3 CONTENTS - EACH VOLUME

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

1.4 AS-BUILTS AND SAMPLES

- .1 In addition to requirements in General Conditions, maintain at the site for Construction Manager one record copy of:
 - .1 Contract Drawings.
 - .2 Specifications.
 - .3 Addenda.

- .4 Change Orders and other modifications to the Contract.
- .5 Reviewed shop drawings, product data, and samples.
- .6 Field test records.
- .7 Inspection certificates.
- .8 Manufacturer's certificates.
- .2 Store record documents and samples in field office apart from documents used for construction. Provide files, racks, and secure storage.
- .3 Label record documents and file in accordance with Section number listings in List of Contents of this Project Manual. Label each document "PROJECT RECORD" in neat, large, printed letters.
- .4 Maintain record documents in clean, dry and legible condition. Do not use record documents for construction purposes.
- .5 Keep record documents and samples available for inspection by Construction Manager.

1.5 RECORDING ACTUAL SITE CONDITIONS

- .1 Record information on set of black line opaque drawings, and in copy of Project Manual, provided by Construction Manager.
- .2 Provide felt tip marking pens, maintaining separate colours for each major system, for recording information.
- .3 Record information concurrently with construction progress. Do not conceal Work until required information is recorded.
- .4 Contract Drawings and shop drawings: legibly mark each item to record actual construction, including:
 - .1 Measured depths of elements of foundation in relation to finish first floor datum.
 - .2 Measured horizontal and vertical locations of underground utilities and appurtenances, referenced to permanent surface improvements.
 - .3 Measured locations of internal utilities and appurtenances, referenced to visible and accessible features of construction.
 - .4 Field changes of dimension and detail.
 - .5 Changes made by change orders.
 - .6 Details not on original Contract Drawings.
 - .7 References to related shop drawings and modifications.
- .5 Specifications: legibly mark each item to record actual construction, including:
 - .1 Manufacturer, trade name, and catalogue number of each product actually installed, particularly optional items and substitute items.
 - .2 Changes made by Addenda and change orders.
- .6 Other Documents: maintain manufacturer's certifications, inspection certifications, field test records, required by individual specifications sections.

1.6 EQUIPMENT AND SYSTEMS

- .1 Each Item of Equipment and Each System: include description of unit or system, and component parts. Give function, normal operation characteristics, and limiting conditions. Include performance curves, with Consultant data and tests, and complete nomenclature and commercial number of replaceable parts.
- .2 Panel board circuit directories: provide electrical service characteristics, controls, and communications.
- .3 Include installed colour coded wiring diagrams.
- .4 Operating Procedures: include start-up, break-in, and routine normal operating instructions and sequences. Include regulation, control, stopping, shut-down, and emergency instructions. Include summer, winter, and any special operating instructions.
- .5 Maintenance Requirements: include routine procedures and guide for trouble-shooting; disassembly, repair, and reassembly instructions; and alignment, adjusting, balancing, and checking instructions.
- .6 Provide servicing and lubrication schedule, and list of lubricants required.

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- .7 Include manufacturer's printed operation and maintenance instructions.
 - .8 Include sequence of operation by controls manufacturer.
 - .9 Provide original manufacturer's parts list, illustrations, assembly drawings, and diagrams required for maintenance.
 - .10 Provide installed control diagrams by controls manufacturer.
 - .11 Provide Contractor's co-ordination drawings, with installed colour coded piping diagrams.
 - .12 Provide charts of valve tag numbers, with location and function of each valve, keyed to flow and control diagrams.
 - .13 Provide list of original manufacturer's spare parts, current prices, and recommended quantities to be maintained in storage.
 - .14 Include test and balancing reports as specified in Section 01450 - Quality Control and Commissioning.
 - .15 Additional requirements: As specified in individual specification sections.
- 1.7 MATERIALS AND FINISHES**
- .1 Building Products, Applied Materials, and Finishes: include product data, with catalogue number, size, composition, and colour and texture designations. Provide information for re-ordering custom manufactured products.
 - .2 Instructions for cleaning agents and methods, precautions against detrimental agents and methods, and recommended schedule for cleaning and maintenance.
 - .3 Moisture-protection and Weather-exposed Products: include manufacturer's recommendations for cleaning agents and methods, precautions against detrimental agents and methods, and recommended schedule for cleaning and maintenance.
 - .4 Additional Requirements: as specified in individual specifications sections.
- 1.8 SPARE PARTS**
- .1 Provide spare parts, in quantities specified in individual specification sections.
 - .2 Provide items of same manufacture and quality as items in Work.
 - .3 Deliver to site, location as directed; place and store.
 - .4 Receive and catalogue all items. Submit inventory listing to Consultant. Include approved listings in Maintenance Manual.
 - .5 Obtain receipt for delivered products and submit prior to final payment.
- 1.9 MAINTENANCE MATERIALS**
- .1 Provide maintenance and extra materials, in quantities specified in individual specification sections.
 - .2 Provide items of same manufacture and quality as items in Work.
 - .3 Deliver to Consultant and store where directed.
 - .4 Receive and catalogue all items. Submit inventory listing to Construction Manager. Include approved listings in Maintenance Manual.
- 1.10 SPECIAL TOOLS**
- .1 Provide special tools, in quantities specified in individual specification section.
 - .2 Provide items with tags identifying their associated function and equipment.
 - .3 Deliver to location as directed; place and store.
 - .4 Receive and catalogue items. Submit inventory listing to Project Manager. Include approved listings in Maintenance Manual.
- 1.10 STORAGE, HANDLING AND PROTECTION**
- .1 Store spare parts, maintenance materials, and special tools in manner to prevent damage or deterioration.
 - .2 Store in original and undamaged condition with manufacturer's seal and labels intact.
 - .3 Store components subject to damage from weather in weatherproof enclosures.
 - .4 Store paints and freezable materials in a heated and ventilated room.

- .5 Remove and replace damaged products at own expense and to satisfaction of Construction Manager.

1.11 WARRANTIES AND BONDS

- .1 Separate each warranty or bond with index tab sheets keyed to Table of Contents listing.
- .2 List subcontractor, supplier, and manufacturer, with name, address, and telephone number of responsible principal.
- .3 Obtain warranties and bonds, executed in duplicate by subcontractors, suppliers, and manufacturers, within ten days after completion of the applicable item of work.
- .4 Except for items put into use with Consultant's permission, leave date of beginning of time of warranty until the Date of Substantial Performance is determined.
- .5 Verify that documents are in proper form, contain full information, and are notarized.
- .6 Co-execute submittals when required.
- .7 Retain warranties and bonds until time specified for submittal.

Part 2 Products NOT USED

Part 3 Execution NOT USED

END OF SECTION

Part 1 General

1.1 SECTION INCLUDES

- .1 This Section includes specific environmental and sustainable development requirements for building materials, products and systems needed to ensure that this project complies with green design processes and clients' sustainable development plan. The sustainable requirements are based on LEED (Leadership in Energy & Environmental Design as classified by Canada Green Building Council (CAGBC).

1.2 RELATED SECTIONS

- .1 Section 01 33 00 - Submittal Procedures.
- .2 Section 01 74 21 - Construction/Demolition Waste Management and Disposal.
- .3 Section 31 25 13 – Erosion and Sediment Control

1.3 REFERENCES

- .1 American Society of Heating, Refrigerating and Air-Conditioning Engineers (ASHRAE)
 - .1 ASHRAE 52.2-[1999], Method of Testing General Ventilation Air Cleaning Devices for Removal Efficiency by Particle Size or latest.
- .2 Canadian Standards Association (CSA International)
 - .1 CSA-S478-95(R2001), Guideline on Durability of Buildings or latest
- .3 Sheet Metal and Air Conditioning National Contractors Association (SMACNA)
 - .1 SMACNA IAQ Guideline for Occupied Buildings Under Construction, 1995 or latest.
- .4 South Coast Air Quality Management District (SCAQMD)
 - .1 SCAQMD Rule #1168, Adhesives & Sealants
 - .2 SCAQMD Rule #1113, Architectural Coatings
- .5 Green Seal
 - .1 Green Seal Standard GS-11, Paints
 - .2 Green Seal Standard GC-03, Anti-Corrosive Paints
- .6 Canada Green Building Council (CaGBC)
 - .1 LEED Canada-NC Version 1.0 Reference Guide

1.4 SUBMITTALS

- .1 Provide submittals for work in accordance with Section 01 33 00 - Submittal Procedures. Submit Recycled and Regional Content Forms (Schedule A & B) on a monthly basis.
- .2 Submit before final payment complete recycled content form, regional content form, and concrete mix form.
 - .1 Failure to submit could result in hold back of final payment.
 - .2 Provide detailed documentation showing recycled content and/or regional material confirmation for each product listed on the forms.
- .3 Material Safety Data Sheets (MSDS)
 - .1 Submit Material Safety Data Sheets (MSDS) in accordance with Section 01 33 00 - Submittal Procedures for the following products. Indicate VOC emissions in g/L for all and urea-formaldehyde content for composite wood. This information must be supplied prior to installation or use.
 - .1 All adhesives, sealants and sealant primers used within the weatherproofing layer of the building envelope.
 - .2 Paints and coatings including primers, under-coatings, sealers and clear wood finishes.
 - .3 Composite wood and laminate adhesives.
- .4 Construction Schedule
 - .1 Submit schedule of construction in accordance with Section 01 33 00 - Submittal Procedures, prior to start of work, in coordination with scheduling requirements, including:

- .1 Sequence of finish applications and allowances for curing times.
- .2 Identification of finish types. See Finish Schedule.
- .3 Schedule and duration of proposed temporary ventilation.
- .4 Delivery schedules of manufactured materials which are anticipated to off-gas in timely manner, which will allow for airing of those materials prior to their scheduled installation.
- .5 Indicate and schedule commissioning procedures and temporary usages of building mechanical systems, identifying types of filtration and schedule for filter replacement.
- .5 IAQ Management Plan
 - .1 Submit Indoor Air Quality (IAQ) Management Plan in accordance with Section 01 33 00 - Submittal Procedures, for construction and preoccupancy phases of building.
- .6 Additional LEED documentation to be provided to green design facilitator upon project completion:
 - .1 Recycled content of all materials, excluding mechanical and electrical components. Cut sheet, letter, product literature or other documentation from manufacturer is acceptable. See Schedule A for Recycled Content Form and Concrete Mix Form.
 - .2 Letter from concrete supplier certifying the reduction in Portland cement from Base Mix to Actual SCM Mix.
 - .3 Regional materials. Must show distance from extraction to the site and final point of manufacture to site, including modes of transportation if further than 800 km away. Cut sheet, letter, product literature or other documentation from manufacturer is acceptable. See Schedule B for Regional Content Form.
 - .4 List of all reused building elements including statements from suppliers stating salvaged or refurbished status of materials.
 - .5 Documentation showing all landfill, salvage and recycling rates for all construction waste in accordance with Section 01 74 21 - Construction/Demolition Waste Management And Disposal.

Part 3 Execution

The following are a series of criteria that are required for compliance with LEED Green Building standards. The green building coordinator will work with the contractor to assist with compliance and offer guidance to completing the tasks. The following is a summary of topic areas covered under the LEED system. A proposed LEED Scorecard is attached for reference.

3.1 EROSION AND SEDIMENTATION CONTROL

- .1 Follow methods and procedures specified in Section 31 25 13 – Erosion and Sediment Control.

3.2 REDUCING SITE DISTURBANCES

- .1 When building is to be on previously undeveloped site comply with following requirements:
 - .1 Avoid major alterations to sensitive topography, vegetation and wildlife habitat in areas indicated.
 - .2 Create traffic patterns that cause minimum site disruptions, as per Consultant's approval.
- .2 Minimize disturbances to watershed using site water management measures to ensure that watersheds and groundwater will be preserved.
- .3 Take measures to avoid soil compaction.

3.3 GENERAL BUILDING DESIGN

- .1 Green design facilitation is used on this project to support green design integration.
 - .1 Green design facilitator provided by Mistecture Architecture and Interiors Inc.

3.4 INDOOR AIR QUALITY

- .1 Construction IAQ Management Plan
 - .1 Develop and implement Indoor Air Quality (IAQ) Management Plan for construction and preoccupancy phases of building as follows:
 - .1 During construction: meet or exceed minimum requirements of SMACNA IAQ Guideline for Occupied Buildings under Construction.
 - .2 Protect stored on-site or installed absorptive materials from moisture damage.
 - .3 Replace filtration media immediately prior to occupancy.
 - .1 Filtration media: in accordance with ASHRAE 52.2, Minimum Efficiency Reporting Value (MERV) of 13.
 - .4 Conduct building flush-out with new filtration media or indoor air quality testing after construction ends and prior to occupancy as per LEED Canada Reference Guide.
 - .1 Adopt IAQ management plan during construction procedures, including:
 - .1 Protection of HVAC system during construction to control pollutant sources, and interrupt pathways for contamination.
 - .2 Sequencing of materials installation to ensure dissipation of high emissions from finishes that off-gas unacceptably high quantities of potentially harmful materials during curing to avoid contamination of absorptive materials.
 - .3 Apply Type 1 interior finishes and allow these finishes to completely cure according to intervals and times stated in respective finish manufactures printed instructions before commencing installation of any Type 2 materials in same area.
 - .4 Do not store any Type 2 materials in areas where installation or curing of Type 1 materials is in progress as per table A
 - .5 Table A

Type 1 Materials: Off Gassing

Materials and finishes which have potential for short term levels of off-gassing from chemicals inherent in their manufacturing process, or which are applied in a form requiring vehicles or carriers for spreading which release a high level of particulate matter in the process of installation and/or curing

These materials include but are not limited to the following:

- Composite wood products, including particleboard and plywood from which millwork, wood paneling, doors or furniture may be fabricated.
- Adhesives, sealants and glazing compounds.
- Wood preservatives, wood finishes, primers and paints and paint like wall finishes.
- Control and/or expansion joint fillers, fire stopping materials and caulking.
- Hard finishes requiring adhesives installation including, but not limited to plastic laminate, linoleum and rubber tile.
- Gypsum board and associated finish processes and products.

Type 2 Materials: Absorptive Soft

Soft materials and finishes which are woven, fibrous, or porous in nature and may absorb chemicals off-gassed by Type 1 materials and finishes, or may be adversely affected by airborne particulate. These materials have the potential to become >sinks= for deleterious substances which may be released much later, or act as collectors of contaminants that may promote subsequent bacterial growth.

These materials include but are not limited to the following:

- Carpet and underpadding, and other woven or fibrous floor finishes.
- Fabric wall coverings.
- Insulation materials exposed to the airstream.
- Acoustic ceiling materials.
- Furnishings with fabric coverings.

- .6 Erect appropriate noise and dust barriers where demolition or construction procedures are to occur adjacent to occupied space.
- .2 Environmental Tobacco Smoke (ETS) Control
- .1 Smoking will not be permitted in building.

3.5 GENERAL CONSTRUCTION MATERIALS/PRACTICES

- .1 Materials and Resources
- .1 Use uncontaminated demolition materials for fill and hardcore and/or granular base.
- .2 Construction Waste Management
- .1 Follow recommendations and requirements of this project's construction, renovation and demolition (CRD) waste management plan in accordance with Section 01 74 21 - Construction/Demolition Waste Management And Disposal.
- .3 Durability
- .1 Follow the Building Durability Plan and principles of CSA S478-95 or latest.

3.6 PAINTS, STAINS, AND VARNISHES

- .1 Use paints and coatings that meet or exceed VOC limits established by Green Seal's Standards GC-03 and GS-11.
- .2 If paint or coating is not covered by Green Seal's standards then refer to SCAQMD Rule #1113.

3.7 SEALANTS, ADHESIVES AND COMPOUNDS

- .1 Use adhesive and sealant products that meet or exceed VOC limits established by SCAQMD Rule #1168.

Schedule A: Recycled Content Form & Concrete Mix Form

Recycled Content Form

Product Name	Company	Product Cost (exclude labour & equipment)	Assembly as % of Product	% Post consumer Recycled Content	% Post Industrial Recycled Content	Recycled Content Information Source

Concrete Content Form

Cost of Concrete	
Cost of Form Materials	

Mix Number	Concrete Design Strength @28d (Mpa)	Air-Entrained (Y/N)	Portland Cement Used (kg/m3)	Volume of Mix (m3)

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			?	x	
Sustainable Sites					14
prereq	1	Erosion & Sedimentation Control	x		
credit	1	Site Selection			
credit	2	Development Density			
credit	2	Redevelopment of Contaminated Sites			
credit	4.1	Alternative Transportation: Public Transportation Access			
	4.2	Alternative Transportation: Bike Storage, change rooms			
	4.3	Alternative Transportation: Alternative Fuel Vehicles			
	4.4	Alternative Transportation: Parking Capacity			
credit	5.1	Reduced Site Disturbance: Protect or restore open space			
	5.2	Reduced Site Disturbance: Development Footprint			
credit	6.1	Stormwater Management: Rate and Quantity			
	6.2	Stormwater Management: Treatment			
credit	7.1	Heat Island Effect: Non-Roof			
	7.2	Heat Island Effect: Roof			
credit	8.0	Light Pollution Reduction			
Water Efficiency					5
credit	1.1	Water Efficient Landscaping: Reduce by 50%			
	1.2	Water Efficient Landscaping: No potable use/no irrigation			
credit	2	Innovative Wastewater Technologies			
credit	3.1	Water Use Reductions: 20% Reduction			
	3.2	Water Use Reductions: 30% Reduction			
Energy & Atmosphere					17
prerequisite	1	Fundamental Building Systems Commissioning	x	x	
prerequisite	2	Minimum Energy Performance	x	x	
prerequisite	3	CFC Reduction in HVAC&R Equipment & Elimination of Halons	x	x	
credit	1	Optimize Energy Performance	3		7
credit	2.1	Renewable Energy: 5%			
	2.2	Renewable Energy: 10%			
	2.3	Renewable Energy: 20%			
credit	3	Best Practice Commissioning			
credit	4	Ozone Protection			
credit	5	Measurement and Verification			
credit	6	Green Power			
Materials & Resources					14
prerequisite	1	Storage and Collection of Recyclables	x		
credit	1.1	Building Reuse: Maintain 75% of existing			
	1.2	Building Reuse: maintain 95% of existing			
	1.3	Building Reuse: maintain 50% of non-struct elements			
credit	2.1	Construction Waste Management: Divert 50% from landfill			
	2.2	Construction Waste Management: Divert 75% from landfill			
credit	3.1	Resource Reuse: 5%			
	3.2	Resource Reuse: 10%			
credit	4.1	Recycled Content: 7.5%			
	4.2	Recycled Content: 15%			
credit	5.1	Regional Materials: 10% extract/manufact regionally			

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credit	5.2	Regional Materials: 28% extract/manufact regionally		
credit	6	Rapidly Renewable Materials		
credit	7	Certified Wood		
credit	8	Durable Building		
Indoor Environmental Quality				15
prerequisite	1	Minimum IAQ Performance	x	x
prerequisite	2	Environmental Tobacco Smoke (ETS) Control	x	x
credit	1	Carbon Dioxide (CO₂) Monitoring		
credit	2	Ventilation Effectiveness		
credit	3	3.1 Construction IAQ Management Plans During Cons.		
		3.2 Construction IAQ Management Plans: Testing before oc		
credit	4	4.1 Low-Emitting Materials: Adhesives and Sealants		
		4.2 Low-Emitting Materials: Paints and Coatings		
		4.3 Low-Emitting Materials: Carpet		
		4.4 Low-Emitting Materials: Composite Wood & Laminate Ad.		
credit	5	Indoor Chemical & Pollutant Source Control		
credit	6	6.1 Controllability of Systems: Perimeter Spaces		
		6.2 Controllability of Systems: Non-Perimeter Spaces		
credit	7	7.1 Thermal Comfort: Compliance		
		7.2 Thermal Comfort: Monitoring		
credit	8	8.1 Daylight & Views: Daylight 75% of Spaces		
		8.2 Daylight & Views: Views 90% of Spaces		
Innovation & Design Process				5
credit	1.1	Innovation in Design:		
	1.2	Innovation in Design:		
	1.3	Innovation in Design:		
	1.4	Innovation in Design:		
credit	2	LEED Accredited Professional		

Rating System Addendum

TOTAL 43 0 **27**

LEED Silver 33-38 points

* we should aspire to at least 42 points, to ensure accreditation

* these are the credits that have either been discussed in meetings or are reasonable to pursue at this point.

END OF SECTION

Part 1 General

1.1 SECTION INCLUDES

- .1 Text, schedules and procedures for systematic Waste Management Program for construction, deconstruction, demolition, and renovation projects.

1.2 RELATED SECTIONS

- .1 Section 013300 - Submittal Procedures.

1.3 DEFINITIONS

- .1 Waste Recovery Target (WRT): Schedule A; a form prepared by the Sustainable Building Coordinator (SBC) that identifies the waste materials that are targeted for recovery during construction (and de-construction).
- .2 Waste Recovery Workplan (WRW): Schedule B; a form that the contractor completes before the start of the project that identifies how he is proposing to fulfill the obligations of material recovery as per the WRT.
- .3 Waste Recovery Inventory Form (WRIF): Schedule C; a form filled out by the contractor as the project proceeds to track all the material leaving the construction (de-construction) site that identifies individual weights and /or volumes of materials.
- .4 Waste Recovery Audit (WRA): Schedule D; a form completed by the contractor that summarizes the actual waste generated and recovered from the project.
- .5 Waste Reduction Agreement (WRA): Schedule E; a form to be signed by all major partners in the construction process to agree to a waste reduction strategy for the project.
- .6 Construction Waste Management Plan (CWMP): Schedule F; a document prepared by the Sustainable Design Coordinator outlining the waste management procedures to ensure compliance with LEED requirements.
- .7 Waste Recycling Centres (WRC): Schedule G; a list of potential recycling firms and agencies in Manitoba.
- .8 Recyclable: Ability of product or material to be recovered at end of its life cycle and re-manufactured into new product for reuse by others.
- .9 Recycle: Process by which waste and recyclable materials are transformed or collected for purpose of being transferred into new products.
- .10 Recycling: Process of sorting, cleansing, treating and reconstituting solid waste and other discarded materials for purpose of using in altered form. Recycling does not include burning, incinerating, or thermally destroying waste.
- .11 Reuse: Repeated use of product in same form but not necessarily for same purpose. Reuse includes:
 - .1 Salvaging reusable materials from re-modelling projects, before demolition stage, for resale, reuse on current project or for storage for use on future projects.
 - .2 Returning reusable items including pallets or unused products to vendors.
- .12 Salvage: Removal of structural and non-structural materials from deconstruction/disassembly projects for purpose of reuse or recycling.
- .13 Source Separation: Acts of keeping different types of waste materials separate beginning from first time they became waste.
- .14 Waste Management Coordinator (WMC): Identified by General Contractor (GC) or Construction Manager (CM) and is responsible for implementation of the CWMP during construction processes. Responsible for supervising waste management activities as well as coordinating related, required submittal and reporting requirements.

1.4 SUBMITTALS

- .1 Submittals in accordance with Section 013300 - Submittal Procedures. Submit WRIF on a monthly basis with request for progress payment.
- .2 Submit before final payment summary of waste materials salvaged for reuse, recycling or disposal by project using waste recovery audit form.
- .3 Failure to submit could result in hold back of final payment.
- .4 Provide receipts, scale tickets, waybills, and show quantities and types of materials reused, recycled or disposed of.
- .5 For each material reused, sold or recycled from project, include amount in tonnes, types and the destination.
- .6 For each material land filled or incinerated from project, include amount in tonnes of material and identity of landfill, incinerator or transfer station.

1.5 DOCUMENTS

- .1 WASTE RECOVERY TARGET (WRT): SCHEDULE A
 - .1 Contractor to review WRT to understand intent for recovery process.
- .2 WASTE REDUCTION WORKPLAN (WRW): Schedule B
 - .1 Contractor to prepare WRW in first few weeks of project start-up.
 - .2 WRW should include but not limited to:
 - .1 Proposed destination of materials to be recovered.
 - .2 Proposed recycling centre location with details of labelling of storage areas.
 - .3 Details on materials handling and removal procedures.
 - .3 Structure WRW to prioritize actions and follow 3R's hierarchy, with Reduction as first priority, followed by Reuse, then Recycle.
 - .4 Identify opportunities for reduction, reuse, and recycling of materials.
 - .5 Post WRW or summary where workers at site are able to review content.
 - .6 Confirm realistic goals for waste reduction, recognize existing barriers and develop strategies to overcome these barriers.
- .3 WASTE RECOVERY INVENTORY FORM (WRIF): SCHEDULE C
 - .1 Contractor to review WRIF and have ready for use prior to project start-up.
 - .2 WRIF should include but not be limited to:
 - .1 Date material left site
 - .2 Vehicle information
 - .3 Destination of materials
 - .4 Material description and division
 - .5 Volume or weight of materials
 - .3 WRIF used to document all materials leaving the site for reuse, recycling or landfill.
 - .4 Send completed forms to LEED Coordinator on a monthly basis.
- .4 WASTE RECOVERY AUDIT (WRA): SCHEDULE D
 - .1 Contractor to complete WRA immediately following construction using information collected from Waste Recovery Inventory Forms. This is a final summary of all waste material recovered.
- .5 WASTE REDUCTION AGREEMENT: SCHEDULE E
 - .1 Contractor to complete Waste Reduction Agreement prior to project start-up with appropriate trades and participants.
- .6 CONSTRUCTION WASTE MANAGEMENT PLAN (CWMP): SCHEDULE F
 - .1 Contractor to review CWMP prior to project start-up.
 - .2 CWMP is to be followed for duration of project.
 - .3 Post CWMP where workers at site are able to review content.

1.6 STORAGE, HANDLING AND PROTECTION

- .1 Store, materials to be reused, recycled and salvaged in locations as directed by Waste Management Coordinator.
- .2 Unless specified otherwise, materials for removal become Contractor's property.
- .3 Protect, stockpile, store and catalogue salvaged items.
- .4 Separate non-salvageable materials from salvaged items. Transport and deliver non-salvageable items to licensed disposal facility.
- .5 Protect surface drainage, mechanical and electrical from damage and blockage.
- .6 Separate and store materials produced during dismantling of structures in designated areas.
- .7 Prevent contamination of materials to be salvaged and recycled and handle materials in accordance with requirements for acceptance by designated facilities.
 - .1 On-site source separation is recommended.
 - .2 Remove co-mingled materials to off-site processing facility for separation.
 - .3 Provide waybills for separated materials.

1.7 DISPOSAL OF WASTES

- .1 Do not bury rubbish or waste materials.
- .2 Do not dispose of liquid waste into waterways, storm, or sanitary sewers.
- .3 Keep records of construction waste including:
 - .1 Number and size of bins.
 - .2 Waste type of each bin.
 - .3 Total tonnage generated.
 - .4 Tonnage reused or recycled.
 - .5 Reused or recycled waste destination.
- .4 Prepare project summary to verify destination and quantities on a material-by-material basis as identified in pre-demolition material audit.

1.8 USE OF SITE AND FACILITIES

- .1 Execute work with least possible interference or disturbance to normal use of premises.
- .2 Maintain security measures established by existing facility.

1.9 SCHEDULING

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

Part 2 Products NOT USED

Part 3 Execution

1.1 APPLICATION

- .1 Do Work in compliance with CWMP.
- .2 Handle waste materials not reused, salvaged, or recycled in accordance with appropriate regulations and codes.

1.2 CLEANING

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

1.3 DIVERSION OF MATERIALS

- .1 From following list, separate materials from general waste stream and stockpile in separate piles or containers, as reviewed by Waste Management Coordinator, and consistent with applicable fire regulations.
 - .1 Mark containers or stockpile areas.
 - .2 Provide instruction on disposal practices.
- .2 On-site sale of materials is not permitted unless approved by owner.

SCHEDULE A – WASTE RECOVERY TARGET (WRT)

	MATERIAL CATEGORY	POTENTIAL MATERIALS	PROPOSED % RECOVERED BY WEIGHT
03	CONCRETE	Foundations, slabs, vaults, concrete waste from new construction	100%
04	MASONRY	Concrete block, Tyndal stone	100%
05	METALS	Rebar in vault, rebar, steel columns and joists, steel lintels, vault door, aluminum, flashings and trim, gutters	100%
06	WOOD	Wall framing, millwork, concrete formwork, glu-lam beams, woodwork, millwork	70%
07	THERMAL/ROOF	Insulation, asphalt roofing, metal roofing	25%
08	DOORS & WINDOWS	Entry doors, interior doors, exterior windows, frames	70%
09	FINISHES	Porcelain tiles, carpets, acoustic ceilings, gypsum board, acoustic panels	50%
10	SPECIALTIES	Moveable walls, blinds, cabinets, signage	75%
11	EQUIPMENT	Elevators, vaults, stoves,	75%
15	MECHANICAL	Ductwork, AHU's, hot water tanks, copper piping, furnaces, sinks, faucets, toilets,	50%
16	ELECTRICAL	Unit heaters, electric baseboard heat, light fixtures, conduit, hand dryers	50%
31	SITE	Asphalt paving, gravel, concrete sidewalks	90%
	PROJECT TOTALS		75%

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SCHEDULE B – WASTE RECOVERY WORKPLAN (WRW)

DIV.	MATERIAL LIST	MATERIAL DESTINATION	ESTIMATE D WEIGHT	PROPOSE D % REUSED / RECYCLE D
03				
04				
05				
06				
07				
08				
09				
10				
11				
15				
16				
31				
	PROJECT TOTALS			

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SCHEDULE D: WASTE RECOVERY AUDIT (WRA):

	MATERIAL CATEGORY	ACTUAL MATERIALS	ACTUAL WEIGHT	ACTUAL % RECOVERED BY WEIGHT
03	CONCRETE			
04	MASONRY			
05	METALS			
06	WOOD			
07	THERMAL/ROOF			
08	DOORS & WINDOWS			
09	FINISHES			
10	SPECIALTIES			
11	EQUIPMENT			
15	MECHANICAL			
16	ELECTRICAL			
31	SITE			
	PROJECT TOTALS			

SCHEDULE E – WASTE REDUCTION AGREEMENT (WRA)

As contractors and subcontractors we understand that the client, **HANSCH CONSTRUCTION**, wishes to carry out this project in an environmentally responsible manner. We acknowledge the waste management submittal requirements and minimum rates of landfill diversion associated with the construction of the new building and the site material. We understand that their designed intention is to ensure that the project's overall goal of 75% (by weight) of the generated waste materials be diverted from landfill by salvaging materials for reuse and recycling is met or exceeded.

Furthermore we understand that throughout the normal course of work it is expected that we employ all reasonable means to reduce the generation and disposal of wastes. Broadly, our waste reduction measures will include:

- 1.1 Adherence to the Waste Audit, Waste Reduction Workplan and Materials Source Separation Program.
- 2.1 Prevention of damage due to material mishandling.
- 3.1 Proper storage and protection.
- 4.1 Proper source separation of materials salvaged for reuse and recycling.
- 5.1 Prevention of contamination.
- 6.1 Use of methods and techniques that minimize waste generation.
- 7.1 Salvage of materials for reuse and recycling.
- 8.1 Reuse of materials on site wherever possible.
- 9.1 Minimizing packaging.
- 10.1 Accurate material quantity estimating.

We, the undersigned, are committed to the waste management objectives of this project and agree to employ all reasonable measures to ensure that the methods, materials and equipment used throughout the duration of this project remain consistent with our goal to reduce the generation of wastes wherever possible and divert a minimum of 75% (by weight) of the wastes generated from landfill.

		COMPANY	SIGNATURE
	OWNER		
	CM/GC OWNER		
	ARCHITECT/SBC		
	SITE SUPERINTENDENT		
	TRADE 1		
	TRADE 2		
	TRADE 3		
	TRADE 4		
	TRADE 5		
	MECHANICAL		
	ELECTRICAL		

SCHEDULE F – CONSTRUCTION WASTE MANAGEMENT PLAN (CWMP)

1.0 Introduction

.1 Project Overview

The PUBLIC WORKS EAST YARD Winnipeg Office is a 88,522 m² new building project on a 20.24 Ha site in Winnipeg, Manitoba targeting a LEED Silver rating.

.2 Intent of Waste Management Work Plan

This Waste Management Work Plan has been developed to outline procedures to minimize landfill waste resulting from construction activities:

- .1 To comply with the criteria of the LEED green building certification program Construction Waste Management credits MR 2.1 and 2.2 to recycle and/or salvage 75% of construction, demolition and land clearing waste.
- .2 To provide a guideline for the General Contractor (GC) and Waste Management Coordinator (WMC) to assist in the de-construction of the site and the protocols for the management of waste in the new construction.

.2 Project Team:

Architects:	Affinity Architecture Inc.
General Contractor:	Ernst Hansch construction
Professional Advisor/ LEED™ Coordinator:	Mistecture Architecture & Interiors Inc.

.3 Existing Site Conditions Overview

The project site consists of a rectangular lot at the corner of Thomas Road and Chester Road. This CWMP deals with management of waste from the construction of the new building.

2.0 Construction Parameters

.1 LEED Project Goals & Guidelines

The PUBLIC WORKS EAST YEARD Winnipeg Office is targeting a Silver Level under the Canadian Green Building Council's Leadership in Energy and Environmental Design Green Building Rating System (LEED™).

The rating system established numerous criteria relative to building reuse, material reuse and recycling during the design, construction and operational phases. These criteria specify precise procedures and objectives that must be achieved if the overall project goals are to be reached. The rating system evaluates criteria in 6 major groupings; Sustainable Sites, Water Efficiency, Energy & Atmosphere, Materials & Resources, Indoor Environmental Quality and Innovation & Design. Please see Specification Section 014715 SUSTAINABLE REQUIREMENTS for additional detail.

The guidelines listed indicate the minimum performance goals identified for the project. They should not be considered solely as the 'target' for the project, but as a minimum standard baseline to be exceeded. The following is the objective to meet the LEED requirements for the construction waste component of the project:

Materials & Resources 2.1 and 2.2: To divert 75% of construction, demolition and land clearing waste from landfill.

.2 Waste Management Coordinator

The GC is to identify and delegate a Waste Management Coordinator, responsible for implementation of the Waste Management Plan for the duration of the construction processes. The WMC should have prior experience in construction waste management and sufficient authority on site to ensure realization of waste management objectives.

Waste Management Coordinator duties to include:

- .1 Oversee and manage the proper implementation of the Waste Management Work Plan and it's efficiency
- .2 Manage the labelling of recycled material bins and minimize material contamination.
- .3 Coordinate storage and protection of materials
- .4 Collect and complete all required documentation to ensure compliance is satisfied regarding LEED™ criteria
- .5 Maintain ongoing accounting of waste management related activity

- .6 Report on waste management activity and progress
- .7 Supervise supplier commitments to 'just-in-time' delivery and reduction of packaging materials.
- .3 Materials
 - .1 In order to achieve the previously stated waste reduction goals and LEED™ target it is necessary to forecast and track material sources. A preliminary estimation of material quantities proposed for the project from new construction is provided in Appendix A of the specification. The information is identified as an indicator of the magnitude of the waste management project only and is not intended as a definitive calculation of actual quantities. Contractors are to provide their own calculations. The WMC is responsible for consistent updating of the materials list for submission to the project design team.
- .4 Waste Reduction
 - .1 Use the following documents located in the specification to target, track and report waste reduction for the project.
 - .1 Waste Recovery Target (WRT): Schedule A
 - .2 Waste Recovery Workplan (WRW): Schedule B
 - .3 Waste Recovery Inventory Form (WRIF): Schedule C
 - .4 Waste Recovery Audit (WRA): Schedule D
- .5 Materials of Greatest Impact
 - .1 Materials contributing most by weight are of greatest concern for reuse and recycling. It is essential that these items be diverted from landfill in order to achieve the LEED credits.
- .6 Landfill Diversion
 - .1 The fundamental goal of the project and purpose of this Construction Waste Management Plan is to ideally reduce land filled non-hazardous waste materials to zero. No materials from the project are to be landfilled until every potential reuse or recycling opportunity has been explored and exhausted.
- .7 Site Specific Re-use / Recycling
 - .1 The General Contractor is responsible for salvaging all useable materials, and for recycling or otherwise diverting from landfill other materials. The GC is responsible to inspect the existing building, and to identify and mark as appropriate all materials to be reused.
 The project design team is to compile and provide a complete reuse and recycling schedule identifying all materials intended for re-use and provide this information to the WMC or GC to ensure that materials are handled and stored suitably.
- .8 Markets for Used Materials
 - .1 A preliminary list of local reuse and recycling facilities is provided in the specification, identifying potential local waste diversion opportunities. This list is not comprehensive, and is not to be construed as an endorsement of any of the facilities identified. Information provided is to be verified by contractors, and not utilized for bidding purposes. Some recycling facilities are remote from Winnipeg and will require effort and cost to send materials to be recycled at the closest possible location. Every effort should be made to use recycling facilities, regardless of location, before other strategies are implemented.
 Where reuse or recycling opportunities do not exist, the following should be considered in order as alternatives to landfill;
 - .1 Re-use of material as-is on site
 - .2 Re-use of refurbished material on site
 - .3 Re-use of material as-is off site
 - .4 Recycle material and use on site (crushed or chipped)
 - .5 Recycle material and use off site
 - .6 Use of material as bio-fuel, on or off site
 - .7 Landfill
- .9 Recycling / Reuse Strategy
 - .1 Site organization and transportation logistics are critical to the efficient sorting and removal of materials..

3.0 Source Separation Program

.1 Program Description

.1 The waste reduction goals of the project dictate that distinct types of materials be reused or recycled. Among others, materials may include:

- .1 Concrete
- .2 Clean dimensional wood
- .3 Plywood, OSB & Particle board
- .4 Metals
- .5 Brick/Stone
- .6 Concrete masonry units
- .7 Asphalt
- .8 Plastics
- .9 Glass
- .10 Gypsum
- .11 Rigid foam insulation
- .12 Asphalt roofing
- .13 Carpet & carpet pad
- .14 Polystyrene
- .15 Organic debris
- .16 Cardboard, paper & packaging
- .17 Beverage containers

.2 Source separation of materials is critical, requiring;

- .1 Adequate number of storage bins of suitable capacity
- .2 Clear labelling of all bins to avoid contamination
- .3 Convenient location of bins for workers and haulers
- .4 Informing workers of the purpose and location of bins
- .5 Informing workers of materials to be reused or recycled on site
- .6 Ensure bins are lockable as required to avoid contamination
- .7 Ensure full bins are picked up quickly to avoid overflow

.3 Careful management and organization of the construction process will facilitate easy source separation of materials. Structural members suitable for re-use as determined by a qualified engineer are to be separated and stored as will all materials designated for reuse and recycling. The WMC is responsible to ensure that all workers on site adhere to the source separation program. The WMC is to inspect bins for contamination, and to record bin contents using material tracking forms prior to bins leaving the site.

4.0 Hauling & Processing of Materials

.1 The WMC will be required to arrange for removal of reusable, recyclable and landfill materials. The WMC will work with the Waste Contractor to identify haulers and processing facilities capable of undertaking work in conformance with waste reduction objectives.

The Contractor is to confirm to the WMC:

- .1 What materials do they accept?
- .2 Will they come to the site to remove materials?
- .3 How frequently will they remove materials?
- .4 Is there a fee for material salvage?
- .5 Will they pay for salvage items?
- .6 Will they visit the site and bid on materials?
- .7 Do they accept material drop-off's at their location?
- .8 Are there charges for dropped-off materials?
- .9 If items are donated to charity, can a tax deduction be provided?
- .10 Ensure haulers are suitably licensed to handle waste leaving the site.

.2 Haulers must be prepared to provide the WMC with detailed weigh bills identifying the type of waste, amount and final destination.

- .3 On-site Processing of Materials
 - .1 Any materials that are reused immediately on site such as crushed rock should be tracked in the same manor but will not be included in calculations. It will be applied to Materials & Resources Credit 5 for Regional Materials.

5.0 Communication

- .1 Training
 - .1 Success in achieving waste management objectives will depend greatly on the workers involved on-site. All workers must receive basic training in proper source separation of materials and waste diversion. Appropriate initial training will allow workers to;
 - .1 Recognize materials to be source separated
 - .2 Assess material quality
 - .3 Understand the location and type of collection bins
 - .4 How to contact the WMC
 - .2 To ensure that all contractors and sub-contractors are fully aware of waste management objectives, the WMC is to conduct a mandatory briefing with all project trades prior to commencing work on site. This meeting can be utilized to communicate the importance of the waste management plan to achieving stated project goals. For logistical purposes this meeting can be combined with other site and safety related orientation training.
 - .3 The WMC should also coordinate occasional briefings with site work crews to ensure clear communication of objectives relating to:
 - .1 Source separation requirements and objectives
 - .2 Reporting requirements as per specification
 - .3 General site layout for construction
 - .4 Waste reduction targets and ongoing performance
 - .5 Workmanship expectations
 - .6 Recycling of food and food related and other incidental waste
- .2 Workmanship
 - .1 The WMC is responsible for ensuring that all subcontractors perform work at all phases of construction utilizing efficient methods to minimize waste in support of the established diversion target.

Procedures supporting this goal include:

 - .1 Maintain a clean organized construction site
 - .2 Cover and protect materials from damage and weather
 - .3 Ensure that accessory items are kept with salvaged materials (i.e. package door hinges, brackets, screws, etc with salvaged doors)
 - .4 Avoid contamination of reusable or recyclable materials with waste
 - .5 Reuse or rent concrete formwork
 - .6 Centralize cutting areas and separate large cut-offs for re-use
 - .7 Order, measure and cut materials carefully and efficiently.
- .3 Waste Management Agreement
 - .1 The WMC is to ensure that all contactors and sub-contractors prior to work commencing sign a Waste Reduction Agreement (see specification). These agreements are to be kept on file by the WMC.
- .4 Tracking, Documentation and Reporting
 - .1 Reporting and documentation is critical to tracking waste management performance in order to ensure that project goals are met or exceeded. A tracking form must be completed by the WMC or designated individual for all waste, reuse or recycle related loads leaving the site. See specification for sample form.
 - .1 Loads identified in the material tracking form must be accompanied by weigh bills and invoices provided by the hauler.
 - .2 To ensure the continuity and correlation of supporting data, the following pieces of information should be collected by the WMC:

- .1 Time and date of removal
- .2 Description of materials
- .3 Weight, volume and quantity of materials
- .4 End destination of materials
- .5 End of use of materials (reuse, recycle or landfill)
- .6 Name of the company or individual removing the material from site
- .3 Waste Recovery Inventory Forms and related weigh bills should be submitted to the LEED™ Co-ordinator monthly detailing the total volumes of waste management activity including percentages reused, recycled or sent to landfill.
 - .1 Materials retained for onsite reuse or recycling should be identified as part of the Waste Management Report.
 - .2 Upon project completion the LEED™ Co-ordinator is responsible for compilation of data collected into a final project summary report detailing waste management performance, and indicating whether project goals have been achieved.
 - .3 Supporting documentation collected throughout the duration of the project is to be submitted with this report.
- .4 The intent of the final waste management report is to provide formal declaration of fulfillment of project objectives, and to provide supporting data for certification.

6.0 Meetings

- .1 Ongoing performance of waste management progress should be reviewed and reported at regularly scheduled project team meetings. The LEED™ Co-ordinator should develop and provide a status report for review at each meeting identifying issues affecting waste management objectives, allowing the project team to monitor waste management progress, and to respond to arising issues in a timely manner.
 If specified waste management objectives are not being met, issues should be addressed by the WMC at weekly site meetings or via a specific waste management meeting to identify problems and determine actions required to rectify the problem.

7.0 Site Logistics

- .1 Site Set-up
 - .1 The General Contractor and Waste Management Coordinator are to manage and coordinate site set up prior to start of any construction work.
 Efficiency of material diversion is directly affected by initial site set-up as waste reduction depends on the efficient flow of reusable and recyclable materials through removal, processing and storage. Maintaining a consistently clean site has direct effect on the ease and ability of workers to adhere to objectives
 Site set-up factors affecting success of waste diversion include:
 - .1 Develop and post a clearly labelled site plan directing workers and haulers, identify the location of recycling and waste bins as well as restricted areas
 - .2 Develop a system to track materials arriving at or being removed from the site, and identify an area for on-site recycling and storage.
 - .3 Organize the site to facilitate efficient movement of vehicles for delivery and removal of materials.
 - .4 Lunch areas with containers for recycling of beverage containers and plastic packaging.
 - .5 Secure the site to prevent vandalism and theft.
- .2 Removal from Site
 - .1 WMC is responsible for ensuring that reusable, recyclable and waste materials are arriving at suitable and agreed upon destinations. Requiring all material haulers and processing facilities provide weigh bills, receipts or other declarations helps to ensure that materials are not going to landfills.

8.0 Scope of Work

- .1 This Work Plan illustrates a methodology to minimize the quantity of material directed to landfill from the construction phases of the project. Achieving the waste reduction objectives will be a critical aspect of the success of the project meeting referenced LEED™ objectives.

SCHEDULE G – WASTE RECYCLING CENTRES (WRC)

MATERIAL	COMPANY	ADDRESS	PHONE
General – Reuse	Habitat For Humanity Restore	60 Archibald, Wpg	(204) 233-5160
General – Reuse	Imrie Acme Demolition Ltd.	20 Meade, Wpg	(204) 943-8000
General – Reuse	Salvage Super Market	1042 Oxford, Wpg	(204) 222-2248
General – Reuse	Rodger's Used Brick	1000 Redonda, Wpg	(204) 661-1442
General – Reuse	Healthy Home Store	2-87 Dakota, Wpg	(204) 255-3779
General – Recycling	Paragon Envirocycle Inc.	1042 Oxford, Wpg	(204) 224-1679
General – Recycling	Western Recycling Services Ltd.	18 Sutherland, Wpg	(204) 943-8752
Metal – Recycling	Chisick Metal Ltd.	2141 Logan, Wpg	(204) 632-1045
Metal – Recycling	General Scrap	Springfield & Bismarck	(204) 222-4221
Metal – Recycling	Holt Metals	550 Messier, Wpg	(204) 233-1807
Metal – Recycling	Industrial Metals Processing Ltd	550 Messier, Wpg	(204) 233-1908
Metal – Recycling	Lazareck Scrap Metal	1021 Logan, Wpg	(204) 774-2492
Metal – Recycling	Logan Iron and Metal Co Ltd	1021 Logan, Wpg	(204) 774-2491
Metal – Recycling	Mandak Metal Processors	1 Railway, Selkirk	(204) 284-1424
Metal – Recycling	Martial Holdings Ltd.	2630 Day, Wpg	(204) 222-5820
Metal – Recycling	McPhillips Salvage Ltd.	22 McPhillips, Wpg	(204) 774-3004
Metal – Recycling	Orloff Scrap Metals	King & Sutherland, Wpg	(204) 589-4303
Metal – Recycling	Western Scrap Metals	18 Sutherland, Wpg	(204) 947-0251
Wood – Recycling	Timberman Recycling	1407 Dugald, Wpg	(204) 235-0125
Wood – Recycling	St Boniface Pallet Company	200 Panet, Wpg	(204) 233-0383
Wood – Recycling	Lumber Lovers Pallet/Wood Recycling	Winnipeg	(204) 772-3053
Glass	Trish Rentals	Winnipeg	(204) 981-8880
Concrete	Rakowski Cartage & Wrecking	1227 Redonda, Wpg	(204) 233-0402
General Recycling	Ace Disposal	606 Provencher, Wpg	(204) 231-2990
General Recycling	BFI Canada Inc	375 Oak Point, Wpg	(204) 633-7914
General Recycling	Phoenix Recycling	76 Hoka, Wpg	(204) 222-5096
General Recycling	Versatech Industries (cardboard)	115 Plymouth, Wpg	(204) 956-9700
General Recycling	Stoneridge Demolition	Winnipeg	(204) 955-1396
General Recycling	Rocky Road Recycling Ltd	4154 McGillivray, Wpg	(204) 832-7802
Salvage	North End Housing Project	40 Parr, Wpg	(204) 953-1890
Salvage	Inner City Renovation	542 Dufferin, Wpg	(204) 586-9600
Salvage	Lazarus Housing	514 Maryland, Wpg	(204) 775-4929
Salvage	R.B. Russell High School	364 Dufferin, Wpg	(204) 589-5301

END OF SECTION

Part 1 General

1.1 REFERENCES

- .1 Canadian Standards Association (CSA International)
 - .1 CSA-A23.1-00/A23.2-09, Concrete Materials and Methods of Concrete Construction/Methods of Test and Standard Practices for Concrete.
 - .2 CSA-O86S1-05, Supplement No. 1 to CAN/CSA-O86-01, Engineering Design in Wood.
 - .3 CSA O121-08, Douglas Fir Plywood
 - .4 CSA S269.1-1975 (R2003), Falsework for Construction Purposes.
 - .5 CAN/CSA-S269.3-M92 R2008), Concrete Formwork, National Standard of Canada

1.2 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Submittals in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Submit shop drawings for formwork and falsework.
 - .1 Submit drawings stamped and signed by professional engineer registered or licensed in Province of Manitoba, Canada.
- .3 Indicate method and schedule of construction, shoring, stripping and re-shoring procedures, materials, arrangement of joints, special architectural exposed finishes, ties, liners, and locations of temporary embedded parts. Comply with CSA S269.1, for falsework drawings. Comply with CAN/CSA-S269.3 for formwork drawings.
- .4 Indicate formwork design data: permissible rate of concrete placement, and temperature of concrete, in forms.
- .5 Indicate sequence of erection and removal of formwork/falsework as directed by Construction Manager.

1.3 DELIVERY, STORAGE AND HANDLING

- .1 In accordance with Section 01 60 00.

Part 2 Products

2.1 MATERIALS

- .1 Formwork materials:
 - .1 For concrete without special architectural features, use wood and wood product formwork materials to CSA-O121, CAN/CSA-O86.
- .2 Form ties:
 - .1 For concrete not designated 'Architectural', use removable or snap-off metal ties, fixed or adjustable length, free of devices leaving holes larger than 25 mm diameter in concrete surface.
- .3 Form liner:
 - .1 Plywood: Douglas Fir to CSA O121, solid one side, square edge.
- .4 Form release agent: non-toxic, biodegradable, low VOC.
- .5 Form stripping agent: colourless mineral oil, non-toxic, biodegradable, low VOC, free of kerosene, with viscosity between 70 and 110s Saybolt Universal, 15 to 24 mm²/s at 40 degrees C, flashpoint minimum 150 degrees C, open cup.
- .6 Falsework materials: to CSA-S269.1.
- .7 Sealant: to Section 07 92 00 - Joint Sealants.

Part 3 Execution

3.1 FABRICATION AND ERECTION

- .1 Verify lines, levels and centres before proceeding with formwork/falsework and ensure dimensions agree with drawings.
- .2 Obtain Construction Manager's approval for use of earth forms framing openings not indicated on drawings.

- .3 Hand trim sides and bottoms and remove loose earth from earth forms before placing concrete.
- .4 Fabricate and erect falsework in accordance with CSA S269.1.
- .5 Do not place shores and mud sills on frozen ground.
- .6 Provide site drainage to prevent washout of soil supporting mud sills and shores.
- .7 Fabricate and erect formwork in accordance with CAN/CSA-S269.3 to produce finished concrete conforming to shape, dimensions, locations and levels indicated within tolerances required by CSA-A23.1/A23.2.
- .8 Construct and align formwork for elevator hoistway in accordance with CSA B44.
- .9 Align form joints and make watertight. Keep form joints to minimum.
- .10 Form chases, slots, openings, drips, recesses, expansion and control joints as indicated.
- .11 Build in anchors, sleeves, and other inserts required to accommodate Work specified in other sections.
 - .1 Ensure that anchors and inserts will not protrude beyond surfaces designated to receive applied finishes, including painting.
- .12 Clean formwork in accordance with CSA-A23.1/A23.2, before placing concrete.

3.2

REMOVAL AND RESHORING

- .1 Re-use formwork and false work subject to requirements of CSA-A23.1/A23.2 -09.

END OF SECTION

Part 1 General

1.1 REFERENCES

- .1 American Concrete Institute (ACI)
 - .1 ACI 315-05, Details and Detailing of Concrete Reinforcement.
 - .2 ACI 315R-04, Manual of Structural and Placing Drawings for Reinforced Concrete Structures.
- .2 American Society for Testing and Materials International (ASTM)
 - .1 ASTM A497/A497M-07, Standard Specification for Steel Welded Wire Reinforcement, Deformed, for Concrete.
 - .2 ASTM A775/A775M-07b, Standard Specification for Epoxy-Coated Reinforcing Steel Bars.
- .3 Canadian Standards Association (CSA International)
 - .1 CSA-A23.1-06/A23.2-09, Concrete Materials and Methods of Concrete Construction/Methods of Test and Standard Practices for Concrete.
 - .2 CSA-A23.3-09, Design of Concrete Structures.
 - .3 CAN/CSA-G30.18-08, Billet-Steel Bars for Concrete Reinforcement, A National Standard of Canada.
 - .4 CSA W186-M1990 (R2007), Welding of Reinforcing Bars in Reinforced Concrete Construction.
- .4 Reinforcing Steel Institute of Canada (RSIC)
 - .1 RSIC-2004, Reinforcing Steel Manual of Standard Practice.

1.2 SUBMITTALS

- .1 Submittals in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Prepare reinforcement drawings in accordance with RSIC Manual of Standard Practice and ACI 315.
- .3 Submit shop drawings including placing of reinforcement and indicate:
 - .1 Bar sizes, spacings, locations of reinforcement and mechanical splices if approved by Consultant, with identifying code marks to permit correct placement without reference to structural drawings.
 - .2 Indicate sizes, spacings and locations of chairs, spacers and hangers.
- .4 Detail lap lengths and bar development lengths to CSA-A23.3.
 - .1 Provide type B tension lap splices.
- .5 Quality Assurance: in accordance with Section 01 40 00 - Quality Control.
 - .1 Mill Test Report: upon request provide Construction Manager with certified copy of mill test report of reinforcing steel, minimum 4 weeks prior to beginning reinforcing work.
 - .2 Upon request submit in writing to Construction Manager proposed source of reinforcement material to be supplied.

Part 2 Products

2.1 MATERIALS

- .1 Substitute different size bars only if permitted in writing by Construction Manager.
- .2 Reinforcing steel: billet steel, grade 400, deformed bars to CAN/CSA-G30.18, unless indicated otherwise.
- .3 Cold-drawn annealed steel wire ties: to ASTM A497/A497M. minimum 16 gauge annealed type.
- .4 Chairs, bolsters, bar supports, spacers: to CSA-A23.1/A23.2. Sized and shaped for strength and support of reinforcement during concrete placement conditions including load bearing pad on bottom to prevent vapour barrier puncture.
- .5 Mechanical splices: subject to approval of Consultant.

2.2 FABRICATION

- .1 Fabricate reinforcing steel in accordance with CSA-A23.1/A23.2 and Reinforcing Steel Manual of Standard Practice by the Reinforcing Steel Institute of Canada.
- .2 Obtain Construction Manager's approval for locations of reinforcement splices other than those shown on placing drawings.
- .3 Ship bundles of bar reinforcement, clearly identified in accordance with bar bending details and lists.

2.3 SOURCE QUALITY CONTROL

- .1 Upon request, provide Construction Manager with certified copy of mill test report of reinforcing steel, showing physical and chemical analysis, minimum 4 weeks prior to beginning reinforcing work.
- .2 Upon request, inform Construction Manager of proposed source of material to be supplied.

Part 3 Execution

3.1 FIELD BENDING

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

3.2 PLACING REINFORCEMENT

- .1 Place reinforcing steel as indicated on placing drawings and in accordance with CSA-A23.1/A23.2.
- .2 Do not displace or damage vapour barrier. Accommodate placement of formed openings.
- .3 Prior to placing concrete, obtain Construction Manager's approval of reinforcing material and placement. Ensure cover to reinforcement is maintained during concrete pour.

END OF SECTION

Part 1 General

1.1 REFERENCES

- .1 American Society for Testing and Materials (ASTM)
 - .1 ASTM C109/C109M-08, Test Method for Compressive Strength of Hydraulic Cement Mortars (Using 2 in. or 50-mm Cube Specimens).
 - .2 ASTM C827-01a (R2005), Test Method for Change in Height at Early Ages of Cylindrical Specimens from Cementitious Mixtures.
 - .3 ASTM C939-09, Test Method for Flow of Grout for Preplaced-Aggregate Concrete.
- .2 Canadian Standards Association (CSA)
 - .1 CAN/CSA-A3000-08, Portland Cement.
 - .2 CAN/CSA-A23.1-09, Concrete Materials and Methods of Concrete Construction.
 - .3 CAN/CSA-A23.2-09, Methods of Test for Concrete.

1.2 CERTIFICATES

- .1 Submit certificates in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Minimum 4 weeks prior to starting concrete work submit to Construction Manager manufacturer's test data and certification by qualified independent inspection and testing laboratory that following materials will meet specified requirements:
 - .1 Portland cement.
 - .2 Blended hydraulic cement.
 - .3 Supplementary cementing materials.
 - .4 Grout.
 - .5 Admixtures.
 - .6 Aggregates.
 - .7 Water.
 - .8 Waterstops.
 - .9 Waterstop joints.
 - .10 Joint filler.
- .3 Provide certification that mix proportions selected will produce concrete of quality, yield and strength as specified in concrete mixes, and will comply with CAN/CSA-A23.1.
- .4 Provide certification that plant, equipment, and materials to be used in concrete comply with requirements of CAN/CSA-A23.1.

1.3 QUALITY ASSURANCE

- .1 Minimum 4 weeks prior to starting concrete work, submit proposed quality control procedures in accordance with Section 01 40 00 - Quality Control for Construction Manager's approval for following items:
 - .1 Hot weather concrete.
 - .2 Cold weather concrete.
 - .3 Curing.
 - .4 Finishes.
 - .5 Formwork removal.
 - .6 Joints.

Part 2 Products

2.1 MATERIALS

- .1 Portland cement: to CAN/CSA-A3000 Type GU .
- .2 Water: to CAN/CSA-A23.1
- .3 Aggregates fine and coarse: to CAN/CSA-A23.1.
- .4 Shrinkage compensating grout: premixed compound consisting of metallic, non-metallic aggregate, Portland cement, water reducing and plasticizing agents.

- .1 Compressive strength: 50 MPa at 28 days.
- .2 Consistency:
 - .1 Fluid: to ASTM C827. Time of efflux through flow cone (ASTM C939), under 30s.
 - .2 Flowable: to ASTM C827. Flow table, 5 drops in 3s, (ASTM C109, applicable portion) 125 to 145%.
 - .3 Plastic: to ASTM C827. Flow table, 5 drops in 3 s, (ASTM C109, applicable portions) 100 to 125 %.
 - .4 Dry pack to manufacturer's requirements.
- .5 Non premixed dry pack grout: composition of non metallic aggregate Portland cement with sufficient water for the mixture to retain its shape when made into a ball by hand and capable of developing compressive strength of 50 MPa at 28 days.
- .6 Non-Shrink Grout: Premixed compound consisting of non-metallic aggregate, cement, water reducing and plasticizing agents; capable of developing minimum compressive strength of 17 MPa in 48 hours and 48MPa in 28 days.
- .7

2.2 MIXES

- .1 Mix and deliver concrete in accordance with CAN/CSA-A23.1, Alternative 1 .
- .2 Cement type as indicated in 2.1
- .3 Minimum 28 day compressive strengths and exposure classifications:
 - .1 Walks curbs and exposed site concrete 32 MPa C2.
 - .2 All other concrete except for concrete columns 30 MPa C4.
 - .3 Nominal size of coarse aggregate clause 14 of CSA A23.1.
 - .4 Slump: to Table 6 of CSA A23.1.
 - .5 Air content: all concrete to contain purposely entrained air in accordance with Table 10 of CSA A23.1
 - .6 Admixtures: to clause 6 of CSA A23.1
 - .7 Add air entraining agent to normal concrete mix for work exposed to exterior.

Part 3 Execution

3.1 PREPARATION

- .1 Obtain Construction Manager's approval before placing concrete. Provide 24 hours notice prior to placing of concrete.
- .2 Pumping of concrete is permitted only after approval of equipment and mix.
- .3 Ensure reinforcement and inserts are not disturbed during concrete placement.
- .4 Prior to placing of concrete obtain Construction Manager's approval of proposed method for protection of concrete during placing and curing.
- .5 Maintain accurate records of poured concrete items to indicate date, location of pour, quality, air temperature and test samples taken.
- .6 In locations where new concrete is dowelled to existing work, drill holes in existing concrete. Place steel dowels and pack solidly with non shrink grout to anchor and hold dowels in positions as indicated.
- .7 Coordinate the placement of joint devices with erection of concrete formwork and placement of form accessories.
- .8 Do not place load upon new concrete until authorized by Construction Manager.

3.2 CONSTRUCTION

- .1 Do cast-in-place concrete work in accordance with CAN/CSA-A23.1.
- .2 Install vapour retarder under interior slabs on grade. Lap joints minimum 150 mm and seal watertight by sealant applied between overlapping edges and ends.
- .3 Repair vapour retarder damaged during placement of concrete reinforcing. Repair with vapour retarder material; lap over damaged areas minimum 150 mm and seal watertight.
- .4 Sleeves and inserts

- .1 No sleeves, ducts, pipes or other openings shall pass through joists, beams, column capitals or columns, except where indicated or approved by Consultant.
- .2 Where approved by Consultant, set sleeves, ties, pipe hangers and other inserts and openings as indicated or specified elsewhere. Sleeves and openings greater than 100 x 100 mm not indicated, must be approved by Construction Manager.
- .3 Do not eliminate or displace reinforcement to accommodate hardware. If inserts cannot be located as specified, obtain approval of modifications from Construction Manager before placing of concrete.
- .4 Check locations and sizes of sleeves and openings shown on drawings.
- .5 Set special inserts for strength testing as indicated and as required by non-destructive method of testing concrete.
- .5 Anchor bolts
 - .1 Set anchor bolts to templates under supervision of appropriate trade prior to placing concrete.
 - .2 With approval of Construction Manager, grout anchor bolts in preformed holes or holes drilled after concrete has set. Formed holes to be minimum 100 mm diameter. Drilled holes to be [minimum 25 mm larger in diameter than bolts used to manufacturer's recommendations.
 - .3 Protect anchor bolt holes from water accumulations, snow and ice build-ups.
 - .4 Set bolts and fill holes with non shrink grout.
 - .5 Locate anchor bolts used in connection with expansion shoes, rollers and rockers with due regard to ambient temperature at time of erection.
- .6 Finishing
 - .1 Screed floors and slabs on grade level, maintaining surface flatness of maximum 6 mm /3 metre.
 - .2 Finish concrete in accordance with CAN/CSA-A23.1.
 - .3 Steel trowel surfaces which will receive carpeting, resilient flooring, seamless flooring, wood flooring. Classification flat.
 - .4 Refer to Division 9 for flooring finish requirements
 - .5 In areas with floor drains, maintain floor elevation at walls; pitch surfaces uniformly to drains at 1:100, 1:50 nominal.
- .7 Toppings
 - .1 Prior to placing floor topping, roughen substrate concrete surface and remove deleterious material. Broom and vacuum clean.
 - .2 Place required reinforcing and other items to be cast in.
 - .3 Place topping concrete to CAN/CSA-A23.1.
 - .4 Apply bonding agent to substrate in accordance with manufacturer's instructions.
 - .5 Apply sand and cement slurry coat on base course, immediately prior to placing toppings.
 - .6 Place concrete toppings to required lines and levels. Place topping in checkerboard panels, dimension not to exceed 6 metre
 - .7 Screed toppings level, maintaining surface flatness of maximum 1:100.
- .8 Waterstops
 - .1 Install waterstops to provide continuous water seal. Do not distort or pierce waterstop in such a way as to hamper performance. Do not displace reinforcement when installing waterstops. Use equipment to manufacturer's requirements to field splice waterstops. Tie waterstops rigidly in place.
 - .2 Use only straight heat sealed butt joints in field. Use factory welded corners and intersections unless otherwise approved by Construction Manager.
- .9 Joint fillers
 - .1 Furnish filler for each joint in single piece for depth and width required for joint, unless otherwise authorized by Construction Manager. When more than one piece is required for a joint, fasten abutting ends and hold securely to shape by stapling or other positive fastening.
 - .2 Locate and form joints as indicated. Install joint filler.
 - .3 Use 12 mm thick joint filler to separate slabs-on-grade from vertical surfaces
 - .4 Install joint devices in accordance with manufacturer's instructions.

- .5 Install construction joint devices in coordination with floor slab pattern placement sequence. Set top to required elevations. Secure to resist movement by wet concrete.
- .6 Install joint device anchors. Maintain correct position to allow joint cover to be flush with floor.
- .7 Install joint covers in one piece longest practical length, when adjacent construction activity is complete.
- .8 Apply sealants in joint devices in accordance with Section 07 92 00.
- .9 Place concrete continuously between predetermined expansion, control, and construction joints.
- .10 Do not interrupt successive placement; do not permit cold joints to occur.
- .11 Place floor slabs in sawcut pattern indicated
- .12 Saw cut joints within 24 hours after placing. Use 3/16 inch blade, cut into 1" depth of slab thickness.

3.3 CURING AND PROTECTION

- .1 Immediately after placement, protect concrete from premature drying, excessively hot or cold temperatures, and mechanical injury.
- .2 Maintain concrete with minimal moisture loss at relatively constant temperature for period necessary for hydration of cement and hardening of concrete.
- .3 Cure concrete floor surfaces to requirements of CSA A23.1

3.4 FIELD QUALITY CONTROL

- .1 Inspection and testing of concrete and concrete materials will be carried out by a Testing Laboratory designated by Construction Manager in accordance with CAN/CSA-A23.1 and Section 01 40 00 - Quality Control.
- .2 Contractor will take additional test cylinders during cold weather concreting. Cure cylinders on job site under same conditions as concrete which they represent.
- .3 Non-destructive Methods for Testing Concrete shall be in accordance with CAN/CSA-A23.2.
- .4 Submit proposed mix design of each class of concrete to Construction Manager for review prior to commencement of work.

END OF SECTION

Part 1 General

1.1 REFERENCES

- .1 Canada Green Building Council (CaGBC)
 - .1 LEED Canada-NC Version 1.0-2004, LEED (Leadership in Energy and Environmental Design): Green Building Rating System Reference Package For New Construction and Major Renovations (including Addendum 2007).
 - .2 LEED Canada-CI Version 1.0-2007, LEED (Leadership in Energy and Environmental Design): Green Building Rating System Reference Guide For Commercial Interiors.
- .2 Canadian General Standards Board (CGSB)
 - .1 CAN/CGSB-25.20-95, Surface Sealer for Floors.
- .3 CSA International
 - .1 CAN/CSA-A23.1-09/A23.2-09, Concrete Materials and Methods of Concrete Construction//Methods of Test for Concrete.
- .4 South Coast Air Quality Management District (SCAQMD), California State
 - .1 SCAQMD Rule 1168-A2005(June 2006), Adhesives and Sealants Applications.

1.2 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Submit submittals in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Product Data:
 - .1 Provide manufacturer's printed product literature and data sheets for concrete finishes and include product characteristics, performance criteria, physical size, finish and limitations.
 - .1 Provide two copies of WHMIS MSDS in accordance with Section 01 35 43 - Environmental Procedures. WHMIS MSDS acceptable to Labour Canada and Health and Welfare Canada for concrete floor treatment materials. Indicate VOC content in g/L.
 - .2 Include application instructions for concrete floor treatments.
- .3 Sustainable Design Submittals: Submittals: in accordance with Section 01 47 15 - LEED Requirements.

1.3 ENVIRONMENTAL REQUIREMENTS

- .1 Temporary lighting: Minimum 1200 W light source, placed 2.5 m above floor surface, for each 40 sq m of floor being treated.
- .2 Electrical power: Provide sufficient electrical power to operate equipment normally used during construction.
- .3 Work area: Make work area water tight protected against rain and detrimental weather conditions.
- .4 Temperature: Maintain ambient temperature of not less than 10 degrees C from 7 days before installation to at least 48 hours after completion of work and maintain relative humidity not higher than 40% during same period.
- .5 Moisture: Ensure concrete substrate is within moisture limits prescribed by flooring manufacturer.
- .6 Safety: Comply with requirements of Workplace Hazardous Materials Information System (WHMIS) regarding use, handling, storage, and disposal of hazardous materials.
- .7 Ventilation:
 - .1 Ventilate area of work as directed by Construction Manager by use of approved portable supply and exhaust fans.
 - .2 Ventilate enclosed spaces.
 - .3 Provide continuous ventilation during and after coating application.

1.4 DELIVERY, STORAGE AND HANDLING

- .1 Deliver, store and handle materials in accordance with Section 01 60 00 – Products and Workmanship and with manufacturer's written instructions.
- .2 Delivery and Acceptance Requirements: Deliver materials to site in original factory packaging, labelled with manufacturer's name, address.

- .3 Packaging Waste Management: remove for reuse and return by manufacturer of pallets, crates, padding, and packaging materials in accordance with Section 01 74 19 - Construction/Demolition Waste Management and Disposal.
 - .1 Materials and Resources Credit: prepare Construction Waste Management plan in accordance with Section 01 74 19 - Construction/Demolition Waste Management and Disposal, Section 01 47 15 LEED Requirements, and 01 33 00 - Closeout Submittals.

Part 2 Products

2.1 SUSTAINABLE REQUIREMENTS

- .1 Materials and products in accordance with Section 01 47 15 LEED Requirements.

2.2 PERFORMANCE REQUIREMENTS

- .1 Product quality and quality of work in accordance with Section 01 60 00 – Products and Workmanship.
- .2 Submit written declaration that components used are compatible and will not adversely affect finished flooring products and their installation adhesives.

2.3 CHEMICAL HARDENERS

- .1 Type 1 - Sodium silicate.
- .2 Water: potable.

2.4 SEALING COMPOUNDS

- .1 Surface sealer: to CAN/CGSB-25.20, Type 2 - water based and to Section 03 35 05.
- .2 Sealants: maximum VOC limit 250 g/L to SCAQMD Rule 1168.
- .3 Surface sealers are not manufactured or formulated with aromatic solvents, formaldehyde] [halogenated solvents, mercury lead, cadmium hexavalent chromium and their compounds.

2.5 CURING COMPOUNDS

- .1 Select low VOC, water-based, organic-solvent free curing compounds.

2.6 CONCRETE STAINS

- .1 Select low VOC, water-based concrete stains.

2.7 MIXES

- .1 Mixing ratios in accordance with manufacturer's written instructions.

Part 3 Execution

3.1 EXAMINATION

- .1 Verify that slab, substrate, site conditions surfaces are ready to receive work and elevations are as indicated on shop drawings, recommended by manufacturer's written instructions.

3.2 PREPARATION OF SLAB

- .1 Rub exposed sharp edges of concrete with carborundum to produce 3 mm radiused edges unless otherwise indicated.
- .2 Saw cut control joints to CAN/CSA-A23.1, 24 hours maximum after placing of concrete.
- .3 Use strong solvent, mechanical stripping to remove chlorinated rubber or existing surface coatings.

- .4 Use protective clothing, eye protection. respiratory equipment during stripping of chlorinated rubber or existing surface coatings.

3.3 APPLICATION

- .1 Apply concrete finishing floor hardener in accordance with manufacturer's written instructions.
- .2 After floor treatment is dry, seal control joints and joints at junction with vertical surfaces with sealant.
 - .1 Sealants: in accordance with Section 07 92 00.
- .3 Apply floor treatment in accordance with Sealer manufacturer's written instructions.
- .4 Clean over spray. Clean sealant from adjacent surfaces.

3.4 CLEANING

- .1 Progress Cleaning: clean in accordance with Section 01 00 02.
 - .1 Leave Work area clean at end of each day.
- .2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 00 02.
- .3 Waste Management: separate waste materials for reuse and recycling in accordance with Section 01 74 19 - Construction/Demolition Waste Management and Disposal, 01 47 15 - LEED Requirements.

3.5 PROTECTION

- .1 Protect finished installation in accordance with manufacturer's instructions.

END OF SECTION

Part 1 General

1.1 SUBMITTALS

- .1 Submit product data in accordance with Section 01 33 00
- .2 Include application instructions for concrete sealer.
- .3 Submit WHMIS MSDS - Material Safety Data Sheets.

1.2 ENVIRONMENTAL REQUIREMENTS

- .1 Temperature
 - .1 Maintain ambient temperature of not less than 10degrees C from 3 days before installation to at least 48 hours after completion of Work and maintain relative humidity not higher than 40% during same period.
 - .2 Maintain substrate temperature at 10 degrees C minimum.
- .2 Moisture:
 - .1 Ensure concrete substrate is within moisture limits prescribed by concrete sealer manufacturer.

Part 2 Products

2.1 SUSTAINABLE REQUIREMENTS

- .1 Materials and products in accordance with Section 01 47 15 - Sustainable Requirements: Construction

2.2 FLOOR SEALER

- .1 Garages and shops CS1: Sika Sikagard SN40 lo-VOC.
- .2 All other areas CS2: SIKA Florseal WB 18.

Part 3 Execution

3.1 EXAMINATION

- .1 Verify that slabsurfaces are ready to receive Work.

3.2 SEALING

- .1 Apply floor sealer CS1 at rate of 2.5 m²/L in accordance with manufacturer's written instructions.
 - .1 Apply two coats.
 - .2 Apply second coat at right angles to first coat.
- .2 Apply floor sealer CS2 at rate of 7.4 to 9.8 m²/L in accordance with manufacturer's written instructions.
- .3 .1 Apply second coat at rate of 7.4 to 14.7 m²/L in accordance with manufacturer's written instructions.
 - .2 Apply second coat at right angles to first coat.

3.3 CLEANING

- .1 Progress Cleaning: clean in accordance with Section 01 00 02.
 - .1 Leave Work area clean at end of each day.
- .2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 00 02.
- .3 Waste Management: separate waste materials for reuse and recycling in accordance with Section 01 74 19 - Construction/Demolition Waste Management and Disposal, 01 47 15 - LEED Requirements.

3.4 PROTECTION

- .1 Protect finished installation until floor sealer has completely cured.

END OF SECTION

Part 1 General**1.1 REFERENCES**

- .1 American Society for Testing and Materials International (ASTM)
 - .1 ASTM A123/A123M-09, Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products.
 - .2 ASTM A185/A185M-05a, Standard Specification for Steel Welded Wire Reinforcement, Plain, for Concrete.
 - .3 ASTM A775/A775M-04a, Standard Specification for Epoxy-Coated Reinforcing Steel Bars.
 - .4 ASTM C260-01, Standard Specification for Air-Entraining Admixtures for Concrete.
 - .5 ASTM D412-98a(2002)e1, Standard Test Methods for Vulcanized Rubber and Thermoplastic Elastomers - Tension.
 - .6 ASTM D2240-05, Standard Test Method for Rubber Property - Durometer Hardness.
- .2 Canadian General Standards Board (CGSB)
 - .1 CAN/CGSB-1.40-97, Anticorrosive Structural Steel Alkyd Primer.
 - .2 CAN/CGSB-1.181-99, Ready Mixed Organic Zinc-Rich Coating.
- .3 Canadian Standards Association (CSA International)
 - .1 CSA-A23.1/A23.2-09, Concrete Materials and Methods of Concrete Construction/Methods of Test and Standard Practices for Concrete.
 - .2 CSA-A23.3-04, Design of Concrete Structures.
 - .3 CSA-A23.405, Precast Concrete - Materials and Construction.
 - .4 CAN/CSA-A3000-03, Cementitious Materials Compendium (Consists of A3001, A3002, A3003, A3004 and A3005).
 - .1 CSA-A3001, Cementitious Materials for Use in Concrete.
 - .5 CAN/CSA-G30.18-M92(R2002), Billet-Steel Bars for Concrete Reinforcement.
 - .6 CAN/CSA-G40.20/G40.21-2004, General Requirements for Rolled or Welded Structural Quality Steel/Structural Quality Steel.
 - .7 CSA-W47.1-03, Certification of Companies for Fusion Welding for Steel.
 - .8 CAN/CSA W48-01(R2006), Filler Metals and Allied Materials for Metal Arc Welding (Developed in co-operation with the Canadian Welding Bureau).
 - .9 CSA-W59-03, Welded Steel Construction (Metal Arc Welding) (Metric version).
 - .10 CSA-W186-M1990(R2002), Welding of Reinforcing Bars in Reinforced Concrete Construction.
- .4 The Master Painters Institute (MPI) - Architectural Painting Specification Manual (ASM) - February 2004
 - .1 MPI # 18, Organic Zinc Rich Primer.
 - .2 MPI # 23, Oil Alkyd Primer.

1.2 DESIGN REQUIREMENTS

- .1 Design precast elements to CSA-A23.3 and CSA-A23.4 to carry handling stresses.
- .2 Design precast elements to carry loads specified by Consultant as indicated on Structural drawings and in accordance with applicable codes.
- .3 Design connections/attachments of precast elements to load/forces specified by Consultant unless indicated.
- .4 Provide detailed calculations and design drawings for typical precast elements and connections as described in PART 1 - SUBMITTALS.

1.3 PERFORMANCE REQUIREMENTS

- .1 Tolerance of precast elements to CSA-A23.4.

1.4 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Submittals in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Submit WHMIS MSDS - Material Safety Data Sheets.
- .3 Submit shop drawings in accordance with CSA-A23.3 and CSA-A23.4 and include following items:
 - .1 Design calculations for items designed by manufacturer.
 - .2 Details of prestressed and non-prestressed members, reinforcement and their connections.
 - .3 Camber.
 - .4 Finishing schedules.
 - .5 Methods of handling and erection.
 - .6 Openings, sleeves, inserts and related reinforcement.
- .4 Submit 2 copies of detailed calculations and design drawings for typical precast elements and connections for review by Construction Manager 2 weeks prior to manufacture.
- .5 Shop Drawings: submit drawings stamped and signed by qualified professional engineer registered or licensed in Province of Manitoba, Canada.
- .6 Submit samples in accordance with Section 01 33 00 - Submittal Procedures and provide sample and sample number of each finish to be used on project to Construction Manager.

1.5 QUALITY ASSURANCE

- .1 Quality Control Plan: submit written report, as described in PART 3 - VERIFICATION, to Consultant verifying compliance that concrete provided meets performance requirements of concrete as established in PART 2 - PRODUCTS.

1.6 QUALIFICATIONS

- .1 Fabricate and erect precast concrete elements by manufacturing plant certified in appropriate category according to CSA-A23.4
- .2 Precast concrete manufacturer to be certified in accordance with CSA's certification procedures for precast concrete plants prior to submitting bid and to specifically verify as part of tender that plant is currently certified in appropriate category, Hollow-Core.
- .3 Only precast elements fabricated in such certified plants to be acceptable to Construction Manager and plant certification to be maintained for duration of fabrication, erection until warranty expires.
- .4 Welding companies certified to CSA-W47.1.

1.7 DELIVERY, STORAGE AND HANDLING

- .1 Deliver, handle and store precast/prestressed units according to manufacturer's instructions.
- .2 Protect unit corners from contacting earth to prevent from staining.
- .3 Waste Management and Disposal: Separate waste materials for reuse and recycling in accordance with Section 01 74 19 - Construction/Demolition Waste Management and Disposal.

Part 2 Products

2.1 MATERIALS

- .1 CSA-A23.1/A23.2- 09.
- .2 CSA-A23.4-04.
- .3 As indicated on Structural Drawings.
- .4 Anchors and supports: to CAN/CSA-G40.21 Type 350 W galvanized after fabrication.
- .5 Welding materials: to CSA W48.
- .6 Welding electrodes: to CSA W48 certified by Canadian Welding Bureau.
- .7 Galvanizing: hot dipped galvanizing with minimum zinc coating of 610 g/m² to ASTM A123/A123M.

- .8 Steel primer: to CAN/CGSB-1.40, MPI #23.
- .9 Zinc-rich primer: to CAN/CGSB-1.181, MPI #18.
- .10 Post-tensioning ducts: to CSA-A23.1/A23.2.

2.2 MIXES

- .1 Concrete:
 - .1 Alternative 1 - Performance Method for specifying concrete: to meet Consultant performance criteria as indicated on Structural drawings in accordance with CAN/CSA-A23.1/A23.2.
 - .1 Ensure concrete supplier meets performance criteria and provide verification of compliance as described in PART 3 - VERIFICATION.
 - .2 Provide quality management plan to ensure verification of concrete quality to specified performance.
 - .3 Concrete supplier's certification.
- .2 Grout:
 - .1 Shrinkage compensating grout: to Section 03 30 00 - Cast-in-Place Concrete.

2.3 MANUFACTURED UNITS

- .1 Manufacture units in accordance with CSA-A23.4.
- .2 Mark each precast unit to correspond to identification mark on shop drawings for location with date cast on part of unit not be exposed.
- .3 Provide hardware suitable for handling elements.

2.4 FINISHES

- .1 Finish units to CSA-A23.4 and as indicated.

2.5 SOURCE QUALITY CONTROL

- .1 Provide Construction Manager with certified copies of quality control tests related to this project as specified in CSA-A23.4, CSA-G279.
- .2 Inspect pre-stressed concrete tendons.
- .3 Provide records from in-house quality control programme based upon plant certification requirements to Construction Manager for inspection and review.
- .5 Upon request, provide Construction Manager with certified copy of mill test report of reinforcing steel supplied, showing physical and chemical analysis.
- .6 Precast plants should keep complete records of supply source of concrete material, steel reinforcement, pre-stressing steel and provide to Construction Manager for review upon request.

Part 3 Execution

3.1 ERECTION

- .1 Do precast concrete work in accordance with CSA-A23.4, CSA-A23.3 and CAN/CSA-S6.
- .2 Do welding in accordance with CSA-W59, for welding to steel structures and CSA-W186, for welding of reinforcement.
- .3 Erect precast elements within allowable tolerances as indicated and specified.
- .4 Non-cumulative erection tolerances in accordance with CSA-A23-4.
- .5 Set elevations and alignment between units to within allowable tolerances before connecting units.
- .6 Grout underside of unit bearing plates with shrinkage compensating grout.
- .7 Fasten precast units in place as indicated on approved shop drawings.
- .8 Secure with bolts using lockwashers or tack-weld nut to bolt.
- .9 Uniformly tighten bolted connections with torque indicated.
- .10 Do not weld or secure bearing plates at sliding joints.

- 3.2**
- .1 **VERIFICATION**
Quality Control Plan: ensure concrete supplier meets performance criteria of concrete as established in Part 2 Products, by Consultant and provide verification of compliance as described in PART 1 - QUALITY ASSURANCE.
- 3.3**
- .1 **CLEANING**
Use cleaning methods as reviewed by Construction Manager before cleaning soiled precast concrete surfaces.

END OF SECTION

Part 1 General

1.1 REFERENCES

- .1 Canadian Standards Association (CSA International)
 - .1 CSA-A23.3-09, Design of Concrete Structures.
 - .2 CAN/CSA-A23.4/A251-09, Precast Concrete-Materials and Construction/Qualification Code for Architectural and Structural Precast Concrete Products.
 - .3 CAN/CSA-G40.20/G40.21-04(R2009), General Requirements for Rolled or Welded Structural Quality Steel/Structural Quality Steel.
 - .3 CAN/CSA-S6-06, Canadian Highway Bridge Design Code.
- .2 Underwriters' Laboratories of Canada (ULC)
 - .1 CAN/ULC-S701-11, Standard for Thermal Insulation, Polystyrene, Boards and Pipe Covering.

1.2 DESIGN REQUIREMENTS

- .1 Design precast elements to CSA-A23.3, CAN/CSA A23.4/A251, CAN/CSA-S6 and to resist handling, stockpiling, shipping and erection stresses.
- .2 Design precast elements to carry loads specified by Construction Manager or as indicated, in accordance with NBCC, applicable codes. Design shall include resistance to creep, shrinkage and temperature effects, as well as wind and earthquake loads.
- .3 Design connections/attachments of precast elements to load/forces specified by Construction Manager. Connections shall be designed to withstand long-term corrosion for exposed elements.
- .4 Submit 2 copies of detailed calculations and design drawings for typical precast elements and connections for Construction Manager for approval weeks prior to manufacture.

1.3 PERFORMANCE REQUIREMENTS

- .1 Tolerance of precast elements to CAN/CSA-A23.4/A251.

1.4 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Submit shop drawings in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Submit shop drawings to CAN/CSA-A23.4/A251 and CSA-A23.3. Include the following items:
 - .1 Design calculations for items designated by manufacturer.
 - .2 Tables and bending diagrams of reinforcing steel.
 - .3 Cambers.
 - .4 Finishing schedules.
 - .5 Methods of handling and erection.
 - .6 Openings, sleeves, inserts and related reinforcement..
- .3 Each drawing submitted shall bear stamp and signature of qualified professional engineer registered or licensed in province of Manitoba, Canada.
- .4 Submit samples in accordance with Section 01 33 00 - Submittal Procedures.

1.5 QUALIFICATIONS

- .1 Precast concrete elements to be fabricated and erected by manufacturing plant certified by Canadian Standards Association in appropriate categories according to CSA A251.
- .2 Precast concrete manufacturer to be certified in accordance with CSA's certification procedures for precast concrete plants prior to submitting tender and to specifically verify as part of tender that plant is currently certified in appropriate categories.
- .3 Only precast elements fabricated in such certified plants to be acceptable to owner, and plant certification to be maintained for duration of fabrication, erection until warranty expires.

1.6 WASTE MANAGEMENT AND DISPOSAL

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

Part 2 Products

2.1 MATERIALS

- .1 Cement, colouring material, aggregates, water, admixtures: to CAN/CSA-A23.4/A251 and CAN/CSA-A23.1/A23.2.
- .2 Exposed aggregate and special facing materials: to match approved finish samples.
- .3 Use same brands and source of cement and aggregate for entire project to ensure uniformity of colouration and other mix characteristics.
- .4 Forms: to CAN/CSA-A23.4/A251.
- .5 Hardware and miscellaneous materials: to CAN/CSA-A23.1/A23.2.
- .6 Anchors and supports: to CAN/CSA-G40.20/G40.21.
- .7 Weep hole tubes: purpose made.
- .8 Insulation: extruded polystyrene to CAN/ULC-S701, Type 3 and Polyisocyanurate to ASTM C591. Thickness as indicated.

2.2 CONCRETE MIXES

- .1 Proportion density concrete in accordance with [CAN/CSA-A23.1/A23.2.

2.3 GROUT MIXES

- .1 Minimum compressive strength: 50 MPa.
- .2 Shrinkage compensating grout: to Section 03 30 00 - Cast-in-Place Concrete.

2.4 FABRICATION

- .1 Manufacture units in accordance with CAN/CSA-A23.4/A251.
- .2 Mark each precast unit to correspond to identification mark on shop drawings for location with date cast on part of unit which will not be exposed.
- .3 Design and attach anchors and inserts to precast concrete elements to carry design loads.
- .4 Shop prime anchors, steel inserts after fabrication and touch up primer on anchors after welding. Do not apply primer to embedded portion of anchors or inserts.
- .5 Galvanize anchors, steel embedments after fabrication and touch up with zinc-rich primer after welding.

2.5 FINISHES

- .1 Finish of textures of precast units to match approved sample.
- .2 Colours of precast units to match approved sample.

2.6 SOURCE QUALITY CONTROL

- .1 Provide Construction Manager with certified copies of quality control tests related to this project as specified in CAN/CSA-A23.4/A251.

Part 3 Execution

3.1 GENERAL

- .1 Do precast concrete work in accordance with CAN/CSA-A23.4/A251 and CAN3-A23.3, CAN/CSA-S6.

3.2

ERECTION

- .1 Erect precast elements within allowable tolerances as indicated.
- .2 Non-cumulative erection tolerances in accordance with CAN/CSA-A23.4/A251.
- .3 Set elevations and alignment between units to within allowable tolerances before connecting units.
- .4 Fasten precast panels in place as indicated on approved shop drawings.
- .5 Secure bolts with lockwashers or tack-weld nut to bolt.
- .6 Uniformly tighten bolted connections with torque indicated.
- .7 Do not weld or secure bearing plates at sliding joints.
- .8 Set units dry, without mortar, attaining specified joint dimension with shims.
- .9 Clean field welds with wire brush and touch-up shop primer with primer, galvanized finish with zinc-rich primer.
- .10 Remove shims and spacers from joints of non-load bearing panels after fastening but before sealant is applied.
- .11 Fill voids with expansion foam sealant/insulation in accordance with Section 07 92 00.
- .12 Apply sealers, sealant to precast panels to manufacturer's recommendations unless specified otherwise.

3.3

WELDING

- .1 Do welding to CSA W59 for welding to steel structures and to CSA W186 for welding of reinforcement.

3.4

CLEANING

- .1 Obtain approval of cleaning methods from Construction Manager before cleaning soiled precast concrete surfaces.

END OF SECTION

Part 1 General

1.1 REFERENCES

- .1 CAN/CSA-A23.1/A23.2-09, Concrete Materials and Methods of Concrete Construction/Methods of Test for Concrete.

Part 2 Products

2.1 MATERIALS SPLASHPADS

- .1 Concrete splash pads: to CSA-A231.2 and as follows:
 - .1 Size: 24" x 12" x 2 1/2" height.
 - .2 Finish: natural.
 - .3 Colour: natural.

Part 3 Execution

3.1 INSTALLATION

- .1 Existing Black pipe: clean out clogged pipes to the approval of Owner's Representative
- .2 Install splash pads true to grade, in accordance with manufacturer's recommendations.

END OF SECTION

Part 1 General

1.1 REFERENCES

- .1 Canadian Standards Association (CSA International)
 - .1 CSA-A165 Series-04, Standards on Concrete Masonry Units.
 - .2 CSA A179-04, Mortar and Grout for Unit Masonry.
 - .3 CSA-A371-04, Masonry Construction for Buildings.
- .2 International Masonry Industry All-Weather Council (IMIAC)
 - .1 Recommended Practices and Guide Specification for Hot and Cold Weather Masonry Construction.

1.2 ADMINISTRATIVE REQUIREMENTS

- .1 Pre-installation meetings: Conduct pre-installation meeting one week prior to commencing work of this Section and on-site installations to:
 - .1 Verify project requirements, including mock-up requirements.
 - .2 Verify substrate conditions.
 - .3 Co-ordinate products, installation methods and techniques.
 - .4 Sequence work of related sections.
 - .5 Co-ordinate with other building subtrades.
 - .6 Review manufacturer's installation instructions.
 - .7 Review masonry cutting operations, methods and tools and determine worker safety and protection from dust during cutting operations.
 - .8 Review warranty requirements.

1.3 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Provide submittals in accordance with Section 01 33 00 - Submittal Procedures
- .2 Product Data:
 - .1 Provide manufacturer's printed product literature, specifications and datasheet and include product characteristics, performance criteria, limitations and colours.
 - .2 Provide two copies of Workplace Hazardous Materials Information System (WHMIS) - Material Safety Data Sheets (MSDS).
- .3 Samples:
 - .1 Provide samples as follows:
 - .1 Two of each type of concrete masonry unit specified, including special shapes, supplemented with specific requirements in Sections.
 - .2 Two cured, and coloured samples of mortar and grout, illustrating mortar colour and colour range, supplemented with specific requirements in Section 04 05 12 - Masonry Mortar and Grout.
 - .3 Two of each type of masonry accessory, supplemented by specific requirements in Section 04 05 23 - Masonry Accessories.
 - .4 Two of each type of masonry anchorage, reinforcement and connector proposed for use, supplemented by specific requirements in Section 04 05 19 - Masonry Anchorage and Reinforcing.
 - .5 Samples: used for testing and when accepted become standard for material used.
- .4 Shop Drawings:
 - .1 Provide drawings stamped and signed by professional engineer registered or licensed in Province of Manitoba, Canada.
 - .2 Provide shop drawings detailing temporary bracing required, designed to resist wind pressure and lateral forces during installation.

1.4 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Certificates: provide manufacturer's product certificates certifying materials comply with specified requirements.
- .2 Test and Evaluation Reports: Provide data for masonry units, in addition to requirements set out in referenced CSA and ASTM Standards, indicating initial rates of absorption.

- .3 Installer Instructions: provide manufacturer's installation instructions, including storage, handling, safety and cleaning.

1.5 QUALITY ASSURANCE

- .1 Qualifications:
 - .1 Manufacturer: capable of providing field service representation during construction and approving application method.
 - .2 Installer: experienced in performing work of this section that has specialized in installation of work similar to that required for this project.
 - .3 Masons: company or person specializing in masonry installations with 5 years documented experience with masonry work similar to this project.
 - .1 Masons employed on this project must demonstrate ability to reproduce mock-up standards.

1.6 DELIVERY, STORAGE, AND HANDLING

- .1 Deliver, store and handle materials in accordance with manufacturer's written instructions.
- .2 Storage and Handling Protection:
 - .1 Keep materials dry until use.
 - .2 Store under waterproof cover on pallets or plank platforms held off ground by means of plank or timber skids.
 - .3 Packaging Waste Management: Remove for reuse and return by manufacturer of pallets, crates, padding, and packaging materials in accordance with Section 01 74 21 - Waste Management.

1.7 SITE CONDITIONS

- .1 Ambient Conditions: assemble and erect components when temperatures are above 4 degrees C.
- .2 Weather Requirements: to CSA-A371, to IMIAC - Recommended Practices and Guide Specifications for Hot and Cold Weather Masonry Construction.
- .3 Cold weather requirements:
 - .1 To CSA-A371 with following requirements.
 - .1 Maintain temperature of mortar between 5 degrees C and 50 degrees C until batch is used or becomes stable.
 - .2 Maintain ambient temperature of masonry work and its constituent materials between 5 degrees C and 50 degrees C and protect site from windchill.
 - .3 Maintain temperature of masonry above 0 degrees C for minimum of 7 days, after mortar is installed.
 - .4 Preheat unheated wall sections in enclosure for minimum 72 hours above 10 degrees C, before applying mortar.
 - .2 Hot weather requirements:
 - .1 Protect freshly laid masonry from drying too rapidly, by means of waterproof, non-staining coverings.
 - .2 Keep masonry dry using waterproof, non-staining coverings that extend over walls and down sides sufficient to protect walls from wind driven rain, until masonry work is completed and protected by flashings or other permanent construction.
 - .3 Spray mortar surface at intervals and keep moist for maximum of three days after installation.

Part 2 Products

2.1 MANUFACTURERS

- .1 Ensure manufacturer has minimum 5 years experience in manufacturing components similar to or exceeding requirements of project.

2.2 MATERIALS

- .1 Masonry materials are specified elsewhere in related Sections of Division 4.

Part 3 Execution

3.1 INSTALLERS

- .1 Experienced and qualified masons to carry out erection, assembly and installation of masonry work.

3.2 MANUFACTURER'S INSTRUCTIONS

- .1 Compliance: comply with manufacturer's written data, including product technical bulletins, product catalogue installation instructions, product carton installation instructions, and data sheets.

3.3 EXAMINATION

- .1 Examine conditions, substrates and work to receive work of this Section.
- .2 Examine openings to receive masonry units. Verify opening size, location, and that opening is square and plumb, and ready to receive work of this Section.
 - .1 Inform Construction Manager of unacceptable conditions immediately upon discovery.
 - .2 Proceed with installation after unacceptable conditions have been remedied and after receipt of written approval from Construction Manager.
- .3 Verification of Conditions:
 - .1 Verify that:
 - .1 Substrate conditions which have been previously installed under other sections or contracts are acceptable for product installation in accordance with manufacturer's instructions prior to installation of concrete block.
 - .2 Field conditions are acceptable and are ready to receive work.
 - .3 Built-in items are in proper location, and ready for roughing into masonry work.
 - .2 Commencing installation means acceptance of existing substrates.

3.4 PREPARATION

- .1 Establish and protect lines, levels, and coursing.
- .2 Protect adjacent materials from damage and disfiguration.

3.5 INSTALLATION

- .1 Do masonry work in accordance with CSA-A371 except where specified otherwise.
- .2 Build masonry plumb, level, and true to line, with vertical joints in alignment, respecting construction tolerances permitted by CSA-A371.
- .3 Layout coursing and bond to achieve correct coursing heights, and continuity of bond above and below openings, with minimum of cutting.

3.6 CONSTRUCTION

- .1 Exposed masonry:
 - .1 Remove chipped, cracked, and otherwise damaged units, in accordance with CSA A-165, in exposed masonry and replace with undamaged units.
- .2 Jointing:
 - .1 Allow joints to set just enough to remove excess water, then tool with round jointer to provide smooth, joints true to line, compressed, uniformly concave joints where concave joints are indicated.
 - .2 Strike flush joints concealed in walls and joints in walls to receive plaster, tile, insulation, or other applied material except paint or similar thin finish coating.

- .3 Cutting:
 - .1 Cut out for electrical switches, outlet boxes, and other recessed or built-in objects.
 - .2 Make cuts straight, clean, and free from uneven edges.
- .4 Building-In:
 - .1 Build in items required to be built into masonry.
 - .2 Prevent displacement of built-in items during construction. Check plumb, location and alignment frequently, as work progresses.
 - .3 Brace door jambs to maintain plumb. Fill spaces between jambs and masonry with mortar.
- .5 Support of loads:
 - .1 Use 30 MPa concrete to Section 03 30 00 - Cast-in-Place Concrete, where concrete fill is used in lieu of solid units.
 - .2 Use grout to CSA A179 where grout is used in lieu of solid units.
 - .3 Install building paper below voids to be filled with concrete, grout; keep paper 25 mm back from faces of units.
- .6 Provision for movement:
 - .1 Leave 3 mm space below shelf angles.
 - .2 Leave 6 mm space between top of non-load bearing walls and partitions and structural elements. Do not use wedges.
 - .3 Built masonry to tie in with stabilizers, with provision for vertical movement.
- .7 Loose steel lintels: Install loose steel lintels. Centre over opening width.
- .8 Control joints: Construct continuous control joints as indicated.
- .9 Movement joints: Build-in continuous movement joints as indicated.

3.7 SITE TOLERANCES

- .1 Tolerances in notes to CSA-A371 apply.

3.8 CLEANING

- .1 Progress Cleaning: in accordance with related masonry sections.
- .2 Final Cleaning:
 - .1 Perform cleaning after installation to remove construction and accumulated environmental dirt.
 - .2 Upon completion of installation and verification of performance of installation, remove surplus materials, rubbish, tools and equipment barriers.
- .3 Waste Management: separate waste materials for reuse and recycling in accordance with Section 01 74 19 - Waste Management.

3.9 PROTECTION

- .1 Temporary Bracing:
 - .1 Provide temporary bracing of masonry work during and after erection until permanent lateral support is in place.
 - .2 Bracing approved by Construction Manager.
 - .3 Brace masonry walls as necessary to resist wind pressure and lateral forces during construction.
- .2 Moisture Protection:
 - .1 Keep masonry dry using waterproof, non-staining coverings that extend over walls and down sides sufficient to protect walls from wind driven rain, until completed and protected by flashing or other permanent construction.
 - .2 Cover completed and partially completed work not enclosed or sheltered with waterproof covering at end of each work day. Anchor securely in position.
 - .3 Air Temperature Protection: protect completed masonry as recommended in 1.9 SITE CONDITIONS.

Part 1 General

1.1 REFERENCES

- .1 Canadian Standards Association (CSA International)
 - .1 CAN/CSA-A23.1/A23.2-04, Concrete Materials and Methods of Concrete Construction/Methods of Test and Standard Practices for Concrete.
 - .2 CAN/CSA A179-04 (R2009), Mortar and Grout for Unit Masonry.
 - .3 CAN/CSA A371-04 (R2009), Masonry Construction for Buildings.
 - .4 CAN/CSA-A3000-03 (2006), Cementitious Materials Compendium; CAN/CSA-A3002-[03], Masonry and Mortar Cement.
- .2 South Coast Air Quality Management District (SCAQMD), California State (SCAQMD)
 - .1 SCAQMD Rule 1168-05, Adhesives and Sealants Applications.

1.2 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Product Data:
 - .1 Provide submittals in accordance with Section 01 33 00 - Submittal Procedures.
 - .2 Provide manufacturer's printed product literature, specifications and datasheets. Include product characteristics, performance criteria, and limitations.
 - .3 Provide two copies of Workplace Hazardous Materials Information System (WHMIS) - Material Safety Data Sheets (MSDS). Indicate VOCs mortar, grout, parging, colour additives and admixtures. Expressed as grams per litre (g/L).
- .2 Samples:
 - .1 Samples: provide unit samples in accordance with Section 04 05 00 - Common Work Results for Masonry, supplemented as follows:
 - .1 Provide two full size samples of mortar, coloured mortar.
 - .2 Provide samples, prior to mixing or preparation of mortars, to Construction Manager of:
 - .1 Aggregate: course aggregate and sand.
 - .2 Cement.
 - .3 Lime.
 - .4 Colour pigment samples.
- .3 Manufacturer's Instructions: Provide manufacturer's installation instructions.

1.3 QUALITY ASSURANCE

- .1 Test Reports: certified test reports including sand gradation tests in accordance with CAN/CSA A179 showing compliance with specified performance characteristics and physical properties, and in accordance with Section 04 05 00 - Common Work Results for Masonry supplemented as follows:
- .2 Certificates: product certificates signed by manufacturer certifying materials comply with specified performance characteristics and criteria and physical requirements.

1.4 DELIVERY, STORAGE, AND HANDLING

- .1 Deliver pre-packaged, dry-blended mortar mix to project site in labelled plastic-lined bags each bearing name and address of manufacturer, production codes or batch numbers, and colour or formula numbers.
- .2 Maintain mortar, grout and packaged materials clean, dry, and protected against dampness, freezing, traffic and contamination by foreign materials.
- .3 Packaging Waste Management: remove for reuse and return by manufacturer of pallets crates padding and packaging materials in accordance with Section 01 74 19 - Waste Management.

1.5 SITE CONDITIONS

- .1 Ambient Conditions: maintain materials and surrounding air temperature to:
 - .1 Minimum 5 degrees C prior to, during, and 48 hours after completion of masonry work.

- .2 Maximum 32 degrees C prior to, during, and 48 hours after completion of masonry work.
- .2 Weather Requirements: CAN/CSA A37, International Masonry Industry All-Weather Council (IMIAC) - Recommended Practices and Guide Specifications for Hot and Cold Weather Masonry Construction.

Part 2 Products

2.1 MATERIALS

- .1 Use same brands of materials and source of aggregate for entire project.
- .2 Cement:
 - .1 Portland Cement: to CAN/CSA-A3000, Type GU - General use hydraulic cement (Type 10, MH-Moderate heat of hydration hydraulic cement (Type 40) gray colour.
 - .1 Use low VOC products [in compliance with SCAQMD Rule 1168.
 - .2 Masonry Cement: to CAN/CSA-A3002 and CAN/CSA A179, Type .S.
 - .3 Mortar Cement: to CAN/CSA-A3002 and CAN/CSA A179, Type .S.
 - .1 Use low VOC products [in compliance with SCAQMD Rule 1168.
 - .4 Packaged Dry Combined Materials for mortar: to CAN/CSA A179, Type S, using gray white colour cement.
- .3 Water: clean and potable.
- .4 Lime:
 - .1 Quick Lime: to CAN/CSA A179, Type S.
 - .2 Hydrated Lime: to CAN/CSA A179, Type S.
- .5 Bonding Agent: epoxy type.
- .6 Polymer Latex: organic polymer latex admixture of butadiene-styrene type non-emulsifiable bonding admixture.
- .7 White mortar: use white Portland cement, and lime, white masonry cement to produce mortar type specified.

2.2 ADMIXTURES

- .1 Water Repellent Agents: Use low VOC products in compliance with SCAQMD Rule 1168.
- .2 Air Entrainment Agents: Use low VOC products in compliance with SCAQMD Rule 1168.
- .3 Plasticizer Agents: Use low VOC products in compliance with SCAQMD Rule 1168.
- .4 Accelerator Agents: Use low VOC products in compliance with SCAQMD Rule 1168.

2.3 MORTAR MIXES

- .1 Mortar for exterior masonry above grade:
 - .1 Loadbearing: type S based on property specifications.
 - .2 Non-Loadbearing: S based on property specifications.
- .2 Mortar for interior masonry:
 - .1 Loadbearing: type S based on property specifications.
 - .2 Non-Loadbearing: N based on property specifications.
- .3 Pointing Mortar: CAN/CSA A179, Type S using property specification with maximum 2 percent ammonium stearate or calcium stearate per cement weigh.
- .4 Following applies regardless of mortar types and uses specified above:
 - .1 Mortar for grouted reinforced masonry: type S based on property specifications.

2.4 MORTAR MIXING

- .1 Use pre-blended, pre-coloured mortar pre-packaged under controlled factory conditions. Ingredients batching limitations to be within 1% accuracy.
- .2 Mix mortar ingredients in accordance with CAN/CSA A179 in quantities needed for immediate use.
- .3 Maintain sand uniformly damp immediately before mixing process.
- .4 Add admixtures in accordance with manufacturer's instructions. Provide uniformity of mix and colouration.

- .5 Do not use anti-freeze compounds including calcium chloride or chloride based compounds.
- .6 Do not add air entraining admixture to mortar mix.
- .7 Use a batch type mixer in accordance with CAN/CSA A179.
- .8 Re-temper mortar only within two hours of mixing, when water is lost by evaporation.
- .9 Use mortar within 2 hours after mixing at temperatures of 32 degrees C, or 2-1/2 hours at temperatures under 10 degrees C.

2.5 GROUT MIXES

- .1 Bond Beams: grout mix 10 to 12.5 MPa strength at 28 days; 200-250 mm slump; premixed type in accordance with CAN/CSA-A23.1.
- .2 Lintels: grout mix 10 to 12.5 MPa strength at 28 days; 200-250 mm slump; premixed type in accordance with CAN/CSA-A23.1.
- .3 Grout: Minimum compressive strength of 12.5 MPa at 28 days. Maximum aggregate size and grout slump: CAN/CSA A179.

2.6 GROUT MIXING

- .1 Mix batched and delivered grout in accordance with CAN/CSA-A23.1 transit mixed.
- .2 Mix grout ingredients in quantities needed for immediate use in accordance with CAN/CSA A179 grout.
- .3 Add admixtures in accordance with manufacturer's instructions; mix uniformly.
- .4 Do not use calcium chloride or chloride based admixtures.

2.7 MIX TESTS

- .1 Testing Mortar Mix:
 - .1 Test mortar in accordance with CAN/CSA A179, for mortar based on property specification. Test prior to construction and during construction for:
 - .1 Compressive strength.
 - .2 Consistency.
 - .3 Mortar aggregate ratio.
 - .4 Sand/cement ratio.
 - .5 Water content and water/cement ratio.
 - .6 Air content.
 - .7 Splitting tensile strength.
- .2 Testing Grout Mix:
 - .1 Test grout in accordance with CAN/CSA A179, for grout based on property specification. Test prior to construction and during construction for:
 - .1 Compressive strength.
 - .2 Sand/cement ratio.
 - .3 Water content and water/cement ratio.
 - .4 Slump.

Part 3 Execution

3.1 EXAMINATION

- .1 Request inspection of spaces to be grouted.

3.2 PREPARATION

- .1 Apply bonding agent to existing concrete surfaces.

3.3 MANUFACTURER'S INSTRUCTIONS

- .1 Compliance: comply with manufacturer's written data, including product technical bulletins, product catalogue installation instructions, product carton installation instructions, and data sheets.

3.4 CONSTRUCTION

- .1 Do masonry mortar and grout work in accordance with CAN/CSA A179 except where specified otherwise.

3.5 MIXING

- .1 All pointing mortar can be mixed using a regular paddle mixer. Only electric motor mixers are permissible. Mixers run on hydrocarbons are not permitted, due to fumes. Mixing by hand must be pre-approved by the Consultant.
- .2 Clean all mixing boards and mechanical mixing machine between batches.
- .3 Mortar must be weaker than the units it is binding.
- .4 Contractor to appoint one individual to mix mortar, for duration of project. In the event that this individual must be changed, mortar mixing must cease until the new individual is trained, and mortar mix is tested.

3.6 MORTAR PLACEMENT

- .1 Install premix mortar to manufacturer's instructions.
- .2 Install mortar to requirements of CAN/CSA A179.
- .3 Remove excess mortar from grout spaces.

3.7 GROUT PLACEMENT

- .1 Install grout in accordance with manufacturer's instructions.
- .2 Install grout in accordance with CAN/CSA A179.
- .3 Work grout into masonry cores and cavities to eliminate voids.
- .4 Do not install grout in lifts greater than 400 mm, without consolidating grout by rodding.
- .5 Do not displace reinforcement while placing grout.

3.8 FIELD QUALITY CONTROL

- .1 Site Tests, Inspection: in accordance with Section 04 05 00 - Common Work Results for Masonry supplemented as follows:
 - .1 Test and evaluate mortar prior to construction and during construction in accordance with CAN/CSA A179.
 - .2 Test and evaluate grout prior to construction and during construction to CAN/CSA A179; test in conjunction with masonry unit sections specified.

3.9 CLEANING

- .1 Upon completion of installation, remove surplus materials, rubbish, tools and equipment barriers.
- .2 Remove droppings and splashings using clean sponge and water.
- .3 Clean masonry with low pressure clean water and soft natural bristle brush.
- .4 Waste Management: separate waste materials for reuse and recycling in accordance with Section 01 74 21 - Waste Management.

3.10 PROTECTION OF COMPLETED WORK

- .1 Cover completed and partially completed work not enclosed or sheltered with waterproof covering at end of each work day. Anchor securely in position.

3.11 SCHEDULE

- .1 Grout following masonry components: See structural drawings..

END OF SECTION

Part 1 General

1.1 REFERENCES

- .1 Canadian Standards Association (CSA International).
 - .1 CAN/CSA-A23.1/A23.2-04, Concrete Materials and Methods of Concrete Construction/Methods of Test for Concrete.
 - .2 CSA-A370-04 (R2009), Connectors for Masonry.
 - .3 CSA-A371-04 (R2009), Masonry Construction for Buildings.
 - .4 CSA G30.14-M1983 (R1998), Deformed Steel Wire For Concrete Reinforcement.
 - .5 CAN/CSA G30.18-M92 (R2002), Billet-Steel Bars for Concrete Reinforcement.
 - .6 CSA-S304.1-04, Masonry Design for Buildings.
 - .7 CSA W186-M1990 (R2007), Welding of Reinforcing Bars in Reinforced Concrete Construction.
 - .8 CSA A179-04 (2009), Mortar and Grout For Unit Masonry.
 - .9 CAN/CSA-G164-M92 (R2003), Hot Dip Galvanizing of Irregularly Shaped Articles.

1.2 SUBMITTALS

- .1 Product Data:
 - .1 Submit manufacturer's printed product literature, specifications and data sheet in accordance with Section 01 33 00 - Submittal Procedures.
 - .2 Submit two copies of WHMIS MSDS - Material Safety Data Sheets in accordance with Section 01 33 00 - Submittal Procedures. Indicate VOC's for epoxy coatings and galvanized protective coatings and touch-up products.
- .2 Shop Drawings
 - .1 Submit shop drawings in accordance with Section 01 33 00 - Submittal Procedures.
 - .2 Shop drawings consist of bar bending details, lists and placing drawings.
 - .3 On placing drawings, indicate sizes, spacing, location and quantities of reinforcement and connectors.

Part 2 Products

2.1 MATERIALS

- .1 Bar reinforcement: to CSA-A371 and CSA G30.18.
- .2 Wire reinforcement: to CSA-A371 and CSA G30.14.
- .3 Connectors: to CSA-A370 and CSA-S304.
 - .1 Slotted block type: designed for application, submit shop drawings.
- .4 Corrosion protection: to CAN/CSA-G164-M92 (R1998), Hot Dip Galvanizing of Irregularly Shaped Articles.
- .5 Slotted Block Type Connectors.

2.2 FABRICATION

- .1 Fabricate reinforcing in accordance with CSA-A23.1 and ANSI/ACI 315-94, Details and Detailing of Concrete Reinforcement.
- .2 Fabricate connectors in accordance with CSA-A370.
- .3 Obtain Construction Manager's approval for locations of reinforcement splices other than shown on placing drawings.
- .4 Upon approval of Construction Manager, weld reinforcement in accordance with CSA W186.
- .5 Ship reinforcement and connectors, clearly identified in accordance with drawings.

Part 3 Execution

3.1 MANUFACTURER'S INSTRUCTIONS

- .1 Compliance: comply with manufacturer's written data, including product technical bulletins, product catalogue installation instructions, product carton installation instructions, and data sheets.

3.2 GENERAL

- .1 Supply and install masonry connectors and reinforcement in accordance with CSA-A370, CSA-A371, CAN/CSA-A23.1 and CSA-S304.1 unless indicated otherwise.
- .2 Prior to placing mortar, grout, obtain Construction Manager's approval of placement of reinforcement and connectors.
- .3 Supply and install additional reinforcement to masonry as indicated.

3.3 REINFORCED LINTELS AND BOND BEAMS

- .1 Reinforce masonry lintels and bond beams as indicated.
- .2 Place and grout reinforcement in accordance with CSA-S304.1, CSA-A371, and CSA-A179.

3.4 ANCHORS

- .1 Supply and install metal anchors as indicated.

3.5 LATERAL SUPPORT AND ANCHORAGE

- .1 Supply and install lateral support and anchorage in accordance with CSA-S304.1 and as indicated.

3.6 MOVEMENT JOINTS

- .1 Reinforcement will not be continuous across movement joints unless otherwise indicated.

3.7 FIELD BENDING

- .1 Do not field bend reinforcement and connectors except where indicated or authorized by Construction Manager.
- .2 When field bending is authorized, bend without heat, applying a slow and steady pressure.
- .3 Replace connectors which develop cracks or splits.

3.8 FIELD TOUCH-UP

- .1 Touch up damaged and cut ends of epoxy coated or galvanized reinforcement steel and connectors with compatible finish to provide continuous coating.

3.9 CLEANING

- .1 Upon completion of installation, remove surplus materials, rubbish, tools and equipment barriers.

END OF SECTION

Part 1 General

1.1 REFERENCES

- .1 Canadian Standards Association (CSA International)
 - .1 CAN/CSA-A165 Series-2004, CSA Standards on Concrete Masonry Units covers: A165.1, A165.2, A165.3.
 - .2 CAN/CSA A371-04 (R2009), Masonry Construction for Buildings.
 - .3 CSA S304.1-04, Design of Masonry Structures.
- .2 South Coast Air Quality Management District (SCAQMD), California State (SCAQMD)
 - .1 SCAQMD Rule 1168-05, Adhesives and Sealants Applications.
- .3 Underwriters' Laboratories of Canada (ULC)
 - .1 CAN/ULC-S101-07, Standard Methods of Fire Endurance Tests of Building Construction and Materials.

1.2 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Provide submittals in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Product Data: Product Data: provide product data, including manufacturer's printed data sheets and catalogue pages illustrating products to be incorporated into project for specified products.

1.3 QUALITY ASSURANCE SUBMITTALS

- .1 Certificates: provide in accordance with Section 04 05 00 - Common Work Results for Masonry.
- .2 Test and Evaluation Reports: provide certified test reports in accordance with Section 04 05 00 - Common Work Results for Masonry.
- .3 Pre-Installation Meetings: conduct pre-installation meeting in accordance with Section 04 05 00 - Common Work Results for Masonry to verify project requirements, manufacturer's installation instructions and manufacturer's warranty requirements.

1.4 DELIVERY, STORAGE, AND HANDLING

- .1 Deliver, store and handle concrete unit masonry in accordance with Section 04 05 00 - Common Work Results for Masonry.
- .2 Packaging Waste Management: Separate and recycle waste materials in accordance with Section 01 74 19 - Waste Management.

Part 2 Products

2.1 MATERIALS

- .1 Standard concrete block units Type H/15/A/M: to CAN/CSA-A165 Series (CAN/CSA-A165.1).
 - .1 Dimensions - Nominal: as indicated on drawings mm wide x 200 mm high x 400 mm long.
 - .2 Special shapes: Provide purpose-made shapes for lintels, beams and bond beams. Provide additional special shapes as indicated.

2.2 REINFORCEMENT

- .1 Reinforcement in accordance with Section 04 05 19 - Masonry Anchorage and Reinforcing.

2.3 CONNECTORS

- .1 Connectors in accordance with Section 04 05 19 - Masonry Anchorage and Reinforcing.

-
- 2.4 MORTAR MIXES**
.1 Mortar and mortar mixes in accordance with Section 04 05 12 - Masonry Mortar and Grout.
- 2.5 GROUT MIXES**
.1 Grout and grout mixes in accordance with Section 04 05 12 - Masonry Mortar and Grout.
- 2.6 CLEANING COMPOUNDS**
.1 Use low VOC products in compliance with SCAQMD Rule 1168.
.2 Compatible with substrate and acceptable to masonry manufacturer for use on products.
.3 Cleaning compounds compatible with concrete unit masonry and in accordance with manufacturer's written recommendations and instructions.
- 2.7 TOLERANCES**
.1 Tolerances for standard concrete unit masonry tolerances in accordance with CAN/CSA A165.1, supplemented as follows:
.1 Maximum variation between units within specific job lot not to exceed 2 mm.
.2 No parallel edge length, width or height dimension for individual unit to differ by more than 2 mm.
.3 Out of square tolerance not to exceed 2 mm.
- Part 3 Execution**
- 3.1 EXAMINATION**
.1 Verify surfaces and conditions are ready to accept work of this Section.
.2 Commencing installation means acceptance of existing substrates.
- 3.2 PREPARATION**
.1 Protect adjacent finished materials from damage due to masonry work.
- 3.3 INSTALLATION**
.1 Concrete block units:
.1 Bond: running.
.2 Coursing height: 200 mm for one block and one joint.
.3 Jointing: concave where exposed or where paint or other finish coating is specified.
.2 Special Shapes:
.1 Install special units to form corners, returns, offsets, reveals and indents without cut ends being exposed and without losing bond or module.
.2 Install reinforced concrete block lintels over openings in masonry where steel or reinforced concrete lintels are not indicated.
.3 End bearing: not less than 200 mm and as indicated on drawings.
.4 Install special shaped units.
- 3.4 REINFORCEMENT**
.1 Install reinforcing in accordance with Section 04 05 19 - Masonry Anchorage and Reinforcing.
- 3.5 CONNECTORS**
.1 Install connectors in accordance with Section .04 05 19 - Masonry Anchorage and Reinforcing.
- 3.6 MORTAR PLACEMENT**
.1 Place mortar in accordance with Section 04 05 12 - Masonry Mortar and Grout.

3.7 GROUT PLACEMENT

- .1 Place grout in accordance with Section 04 05 12 - Masonry Mortar and Grout.

3.8 CONSTRUCTION

- .1 Cull out masonry units, in accordance with CAN/CSA A165, with chips, cracks, broken corners, excessive colour and texture variation.
- .2 Build in miscellaneous items such as bearing plates, steel angles, bolts, anchors, inserts, sleeves and conduits.
- .3 Construct masonry walls using running bond unless otherwise noted.
- .4 Build around frames previously set and braced. Fill behind hollow frames within masonry walls with mortar or grout and embed anchors.
- .5 Fit masonry closely against electrical and plumbing outlets so collars, plates and covers overlap and conceal cuts.
- .6 Install movement joints and keep free of mortar where indicated.
- .7 Hollow Units: spread mortar setting bed from outside edge of face shells. Gauge amount of mortar on top and end of unit to create full joints, equivalent to shell thickness. Avoid excess mortar.
- .8 Solid Units: apply mortar over entire vertical and horizontal surfaces. Avoid bridging of airspace between brick veneer and backup wall with mortar.
- .9 Ensure compacted head joints. Use full or face-shell joint as indicated.
- .10 Tamp units firmly into place.
- .11 Do not adjust masonry units after mortar has set. Where resetting of masonry is required, remove, clean and reset units in new mortar.
- .12 Tool exposed joints concave; strike concealed joints flush.
- .13 After mortar has achieved initial set up, tool joints.
- .14 Do not interrupt bond below or above openings.

3.9 REPAIR/RESTORATION

- .1 Upon completion of masonry, fill holes and cracks, remove loose mortar and repair defective work.

3.10 CLEANING

- .1 Cleaning, supplemented as follows.
 - .1 Progress Cleaning: Standard Concrete Unit Masonry:
 - .1 Allow mortar droppings on masonry to partially dry then remove by means of trowel, followed by rubbing lightly with small piece of block. Clean wall surface with suitable brush or burlap.

3.11 PROTECTION

- .1 Brace and protect concrete unit masonry in accordance with Section 04 05 00 - Common Work Results for Masonry.

END OF SECTION

Part 1 General**1.1 REFERENCES**

- .1 ASTM International Inc.
 - .1 ASTM A123/A123M-09, Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products.
 - .2 ASTM A36/A36M-08, Standard Specification for Carbon Structural Steel.
 - .3 ASTM A193/A193M-08, Standard Specification for Alloy-Steel and Stainless Steel Bolting Materials for High-Temperature or High-Pressure Service and Other Special Purpose Applications.
 - .4 ASTM A325M-08, Standard Specification for Structural Bolts, Steel, Heat Treated 830 MPa Minimum Tensile Strength Metric.
 - .5 ASTM A490M-04ae Standard Specification for High-Strength Steel Structural Bolts, Classes 10.9 and 10.9.3, for Structural Steel Joints Metric.
 - .6 ASTM F1554-04 Standard Specification for Anchor Bolts, Steel, 36, 55, and 105-ksi Yield Strength
- .2 Canadian General Standards Board (CGSB)
 - .1 CAN/CGSB-85.10-99, Protective Coatings for Metals.
- .3 Canadian Institute of Steel Construction (CISC)/Canadian Paint Manufacturers Association (CPMA).
 - .1 Handbook of the Canadian Institute of Steel Construction.
 - .2 CISC/CPMA Standard 2-75, Quick-Drying Primer for use on Structural Steel.
- .4 Canadian Standards Association (CSA International)
 - .1 CSA G40.20/G40.21-04, General Requirements for Rolled or Welded Structural Quality Steel/Structural Quality Steel.
 - .2 CAN/CSA-S16-01 (R2007), Limit States Design of Steel Structures.
 - .3 CAN/CSA-S136-07, North American Specifications for the Design of Cold Formed Steel Structural Members.
 - .4 CSA W47.1-09, Certification of Companies for Fusion Welding of Steel.
 - .5 CSA W48-06(R2011), Filler Metals and Allied Materials for Metal Arc Welding.
 - .6 CSA W55.3-1965 (R2003), Resistance Welding Qualification Code for Fabricators of Structural Members Used in Buildings.
 - .7 CSA W59-03 (R2008), Welded Steel Construction (Metal Arc Welding).
- .5 Master Painters Institute
 - .1 MPI-INT 5.1, Structural Steel and Metal Fabrications.
 - .2 MPI-EXT 5.1, Structural Steel and Metal Fabrications.
- .6 The Society for Protective Coatings (SSPC) and National Association of Corrosion Engineers (NACE) International
 - .1 NACE No. 3/SSPC SP-6-06, Commercial Blast Cleaning.

1.2 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Provide submittals in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Shop Drawings:
 - .1 Provide drawings stamped and signed by professional engineer registered or licensed in the Province of Manitoba, Canada.
- .3 Erection drawings:
 - .1 Submit erection drawings indicating details and information necessary for assembly and erection purposes including:
 - .1 Description of methods.
 - .2 Sequence of erection.
 - .3 Type of equipment used in erection.
 - .4 Temporary bracings.
- .4 Fabrication drawings:
 - .1 Submit fabrication drawings showing designed assemblies, components and connections are stamped and signed by qualified professional engineer licensed in the Province of Manitoba, Canada.

1.3 DELIVERY, STORAGE AND HANDLING

- .1 Deliver, store and handle materials in accordance with Section 01 61 00 - Common Product Requirements.
- .2 Deliver materials in manufacturer's original, undamaged containers with identification labels intact.

Part 2 Products

2.1 DESIGN REQUIREMENTS

- .1 Design details and connections in accordance with requirements of CAN/CSA-S16 and CAN/CSA-S136 with CSA-S136.1 to resist forces, moments, shears and allow for movements indicated.
- .2 Shear connections:
 - .1 Select framed beam shear connections from an industry accepted publication such as "Handbook of the Canadian Institute of Steel Construction" when connection for shear only (standard connection) is required.
 - .2 Select or design connections to support reaction from maximum uniformly distributed load that can be safely supported by beam in bending, provided no point loads act on beam, when shears are not indicated.

2.2 MATERIALS

- .1 Structural steel: to CSA-G40.20/G40.21 Grade 350W.
- .2 Anchor bolts: to ASTM F1554.
- .3 Bolts, nuts and washers: to ASTM A325M.
- .4 Shop paint primer: to CISC/CPMA2-75 solvent reducible alkyd, red oxide.
 - .1 Hot dip galvanizing: galvanize steel, where indicated, to ASTM A123/A123M minimum zinc coating of 600 g/m².

2.3 FABRICATION

- .1 Fabricate structural steel in accordance with CAN/CSA-S16 and in accordance with reviewed shop drawings.

2.4 SHOP PAINTING

- .1 Clean, prepare surfaces and shop prime structural steel in accordance with CAN/CSA-S16 except where members to be encased in concrete.
- .2 Clean members; remove loose mill scale, rust, oil, dirt and foreign matter. Prepare surface according to NACE No.3/SSPC-SP-6.
- .3 Apply one coat of primer in shop to steel surfaces, except:
 - .1 Surfaces to be encased in concrete.
 - .2 Surfaces and edges to be field welded.
 - .3 Faying surfaces of slip-critical connections.
- .4 Apply paint under cover; on dry surfaces when surface and air temperatures are above 5 degrees C.
- .5 Maintain dry condition and 5 degrees C minimum temperature until paint is thoroughly dry.
- .6 Strip paint from bolts, nuts, sharp edges and corners before prime coat is dry.

Part 3 Execution

3.1 APPLICATION

- .1 Manufacturer's Instructions: comply with manufacturer's written recommendations, including product technical bulletins, handling, storage and installation instructions, and datasheets.

3.2 GENERAL

- .1 Structural steel work: in accordance with CAN/CSA-S16 and CAN/CSA-S136.
- .2 Welding: in accordance with CSA W59.
- .3 Companies to be certified under Division 1 or 2.1 of CSA W47.1 for fusion welding of steel structures and/or CSA W55.3 for resistance welding of structural components.

3.3 MARKING

- .1 Mark materials in accordance with CSA G40.20/G40.21. Do not use die stamping. When steel is to be left in unpainted condition, place marking at locations not visible from exterior after erection.

3.4 ERECTION

- .1 Erect structural steel, as indicated and in accordance with CAN/CSA-S16 CAN/CSA-S136 and in accordance with reviewed erection drawings.
- .2 Field cutting or altering structural members: to approval of Construction Manager.
- .3 Clean with mechanical brush and touch up shop primer to bolts, rivets, welds and burned or scratched surfaces at completion of erection.
- .4 Continuously seal members by continuous welds where indicated. Grind smooth.

3.5 FIELD PAINTING

- .1 Paint in accordance with Section 09 90 00 - Painting.
 - .1 Touch up damaged surfaces and surfaces without shop coat with primer to NACE No.3/SSPC-SP-6 except as specified otherwise. Apply in accordance: MPI Architectural Painting Specification Manual.

3.6 CLEANING

- .1 Waste Management: separate waste materials for reuse and recycling in accordance with Section 01 74 21 - Construction/Demolition Waste Management and Disposal.

END OF SECTION

Part 1 General

1.1 REFERENCES

- .1 Canadian General Standards Board (CGSB)
 - .1 CAN/CGSB-1.40-97, Anticorrosive Structural Steel Alkyd Primer.
 - .2 CAN/CGSB-1.105-M91, Quick Drying Primer.
 - .3 CAN/CGSB-85.10-99, Protective Coatings for Metals.
 - .4 CAN/CGSB-85.100-93, Painting.
- .2 Canadian Institute of Steel Construction (CISC)/Canadian Paint Manufacturer's Association (CPMA)
 - .1 CISC/CPMA 2-75, Quick-Drying, Primer for Use on Structural Steel.
 - .2 CISC/CPMA 1-73a, Quick-Drying, One-Coat Paint for Use on Structural Steel.
- .3 Canadian Standards Association (CSA International)
 - .1 CSA-G40.20/G40.21-04(R2009), General Requirements for Rolled or Welded Structural Quality Steel/Structural Quality Steel.
 - .2 CAN/CSA-S16-09, Limit States Design of Steel Structures.
 - .3 CSA-S136-07, Cold Formed Steel Structural Members.
 - .4 CSA-W47.1-09, Certification of Companies for Fusion Welding of Steel Structures.
 - .5 CSA-W55.3-08, Resistance Welding Qualification Code for Fabricators of Structural Members Used in Buildings.
 - .6 CSA-W59-03(R2008), Welded Steel Construction (Metal Arc Welding) Metric.
 - .7 CSA-W59S1-M1989(R1998), Supplement No.1-M1989, Steel Fixed Offshore Structures, to W59- M1989(R1998), Welded Steel Construction (Metal Arc Welding).

1.2 QUALITY ASSURANCE

- .1 Submit 2 copies of mill test reports at least 4 weeks prior to fabrication of steel joists and accessories. Reports to show:
 - .1 Chemical and physical properties.
 - .2 Other details of steel to be incorporated into work.
 - .3 Certification by qualified metallurgists confirming that tests conform to requirements of CSA G40.20/G40.21

1.3 DESIGN OF STEEL JOISTS AND BRIDGING

- .1 Design steel joists and bridging to carry loads indicated on the structural drawings in accordance with CAN/CSA-S16, CSA-S136.
- .2 Design joists and anchorages for uplift forces as required in the building codes.
- .3 Ensure joists are manufactured to consider load effects due to fabrication, erection and handling.
- .4 Limit roof joist deflection due to specified live load to $l/240$ of the span.
- .5 Submit copies of joist design drawings for typical joists for Construction Manager to review at least 4weeks prior to fabrication and/or delivery.

1.4 SHOP DRAWINGS

- .1 Submit shop details and erection drawings in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Submit drawings stamped and signed by qualified professional engineer registered in the province of Manitoba, Canada.
- .3 Indicate on erection drawings, relevant details such as joist mark, depth, spacing, bridging lines, bearing, anchorage and details.
- .4 Provide particulars, on shop drawings, relative to joist geometry, framed openings, splicing details, bearing and anchorage. Include member size, properties, specified and factored member loads, and stresses under various loadings, deflection and camber.

1.5 WASTE MANAGEMENT AND DISPOSAL

- .1 Separate and recycle waste materials in accordance with Section 01 74 19 - Construction/Demolition Waste Management And Disposal.
- .2 Remove from site and dispose of packaging materials at appropriate recycling facilities.
- .3 Collect and separate for disposal paper, plastic, polystyrene, corrugated cardboard packaging material in appropriate on-site for recycling in accordance with Waste Management Plan.
- .4 Divert unused metal materials from landfill to metal recycling facility. Dispose of unused paint material at official hazardous material collections site.
- .5 Do not dispose of unused paint material into sewer system, into streams, lakes, onto ground or in other locations where it will pose health or environmental hazard.

Part 2 Products

2.1 MATERIALS

- .1 Structural steel: to CSA-G40.20/G40.21 and CSA-S136.
- .2 Welding materials: to CSA-W59 with CSA-W59S1.
- .3 Shop paint primer: to CISC/CPMA-2.
- .4 Galvanizing: ASTM A653/A653M-11.

2.2 FABRICATION

- .1 Fabricate steel joists and accessories as indicated in accordance with CAN/CSA-S16.1 CSA-S136 and in accordance with reviewed shop drawings.
- .2 Weld in accordance with CSA-W59 and with CSA-W59S1.
- .3 Provide bottom chord extensions where indicated.
- .4 Provide diagonal and horizontal bridgings and anchorages as indicated.

2.3 SHOP PAINTING

- .1 Clean, prepare and shop prime surfaces of steel joists to CAN/CSA-S16 CAN/CGSB-85.100.
- .2 Clean members of loose mill scale, rust, oil, dirt and other foreign matter. Prepare surfaces in accordance with SSPC SP1 brush blast.
- .3 Apply one coat of CISC/CPMA 2 primer to steel surfaces to achieve maximum dry film thickness of .065 mm to .080 mm except: Surfaces and edges to be field welded.
- .4 Apply paint under cover; on dry surfaces when surface and air temperatures are above 5 degrees C.
- .5 Maintain dry condition and 5 degrees C minimum temperature until paint is thoroughly dry.
- .6 Strip paint bolts, nuts, sharp edges and corners before prime coat is dry.
- .7 Galvanize joists to ASTM A653/A653M-11.

Part 3 Execution

3.1 GENERAL

- .1 Structural steel work: in accordance with CAN/CSA-S16 and CSA-S136.
- .2 Welding: in accordance with CSA-W59 and with CSA-W59S1.
- .3 Companies to be certified under Division 1 or 2.1 of CSA-W47.1 for fusion welding and/or CSA-W55.3 for resistance welding.
- .4 Provide certification that welded joints are qualified by Canadian Welding Bureau.

3.2 ERECTION

- .1 Erect steel joists [and bridging] as indicated in accordance with CAN/CSA-S16 and in accordance with reviewed erection drawings.
- .2 Complete installation of all bridging and anchorages before placing construction loads on joists.

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- .3 Field cutting or altering joists or bridging that are not shown on shop drawings: to approval of Engineer.
 - .4 Clean and touch up shop primer to bolts, welds, burned or scratched surfaces at completion of erection.

3.3

FIELD PAINTING

- .1 Paint: in accordance with Section 09 90 00 - Painting.
- .2 Touch up all damaged surfaces and surfaces without shop coat with CISC/CPMA-2 in accordance with manufacturers' recommendations to CAN/CGSB-85.10.

END OF SECTION

Part 1 General

1.1 REFERENCES

- .1 American Society for Testing and Materials International, (ASTM)
 - .1 ASTM A653/A653M-11, Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.
 - .2 ASTM A792/A792M-10, Specification for Steel Sheet, 55%Aluminum-Zinc Alloy-Coated by the Hot-Dip Process.
- .2 Canadian General Standards Board (CGSB)
 - .1 CAN/CGSB-1.181-99, Ready-Mixed Organic Zinc-Rich Coating.
- .3 Canadian Standards Association (CSA International)
 - .1 CSA C22.2 No.79-1978(R2008), Cellular Metal and Cellular Concrete Floor Raceways and Fittings.
 - .2 CAN/CSA-S16.1-94(R2000), Limit States Design of Steel Structures.
 - .3 CSA-S136-07, Cold Formed Steel Structural Members.
 - .4 CSA W47.1-09, Certification of Companies for Fusion Welding of Steel Structures.
 - .5 CSA W55.3-08, Resistance Welding Qualification Code for Fabricators of Structural Members Used in Buildings.
 - .6 CSA W59-03(R2008), Welded Steel Construction, (Metal Arc Welding) Metric.
- .4 Canadian Sheet Steel Building Institute (CSSBI)
 - .1 CSSBI 10M-96, Standard for Steel Roof Deck.

1.2 DESIGN REQUIREMENTS

- .1 Design steel deck using limit states design in accordance with CSA S136, CSSBI 10M and CSSBI 12M.
- .2 Steel deck and connections to steel framing to carry dead, live and other loads including lateral loads, diaphragm action, composite deck action, and uplift as indicated.
- .3 Deflection under specified live load not to exceed 1/240 of span.

1.3 SHOP DRAWINGS

- .1 Submit shop drawings erection and shoring drawings in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Submit drawings stamped and signed by qualified professional engineer registered or licensed in the Province of Manitoba, Canada.
- .3 Submit design calculations if requested by Construction Manager.
- .4 Indicate deck plan, profile, dimensions, base steel thickness, metallic coating designation, connections to supports and spacings, projections, openings, reinforcement details and accessories.

1.4 WASTE MANAGEMENT AND DISPOSAL

- .1 Separate and recycle waste materials in accordance with Section 01 74 21 - Construction/Demolition Waste Management And Disposal.
- .2 Divert unused metal from landfill to metal recycling facility.
- .3 Dispose of unused paint material at official hazardous material collections site.
- .4 Do not dispose of unused paint material into sewer system, into streams, lakes, onto ground or in other location where it will pose health or environmental hazard.
- .5 Dispose of unused caulking material at official hazardous material collections site.

Part 2 Products

2.1 MATERIALS

- .1 Zinc-iron Alloy (ZF) coated steel sheet: to ASTM A653/A653M structural quality Grade 255, with ZF75 coating, for interior surfaces not exposed to weather, 0.76 mm minimum base steel thickness.

- .2 Zinc (Z) coated steel sheet: to ASTM A653/A653M structural quality Grade 255, with ZF75, coating, for exterior surfaces exposed to weather, 0.76 mm minimum base steel thickness.
- .3 Closures: as indicated in accordance with manufacturer's recommendations.
- .4 Primer: zinc rich, ready mix to CAN/CGSB-1.181.

2.2 TYPES OF DECKING

- .1 Steel roof deck: 0.76 mm minimum base steel thickness, 38 mm maximum deep profile, non-cellular, interlocking side laps.
- .2 Galvanized deck as indicated.

Part 3 Execution

- .1 Structural steel work: in accordance with CAN/CSA-S136 and CSSBI 10M and CSSBI 12M.
- .2 Welding: in accordance with CSA W59, except where specified otherwise.
- .3 Companies to be certified under Division 1 or 2.1 of CSA W47.1 for fusion welding of steel and/or CSA W55.3 for resistance welding.

3.2 ERECTION

- .1 Erect steel deck as indicated and in accordance with CSA S136 CSSBI 10M and CSSBI 12M and in accordance with reviewed erection drawings.
- .2 Butt ends: to 1.5 to 3 mm gap. Install steel cover plates over gaps wider than 3 mm.
- .3 Lap ends: to 50 mm minimum.
- .4 Immediately after deck is permanently secured in place, touch up metallic coated top surface with compatible primer where burned by welding.

3.3 CLOSURES

- .1 Install closures in accordance with approved details.

3.4 OPENINGS AND AREAS OF CONCENTRATED LOADS

- .1 No reinforcement required for openings cut in deck which are smaller than 150 mm square.
- .2 Frame deck openings with any one dimension between 150 to 300 mm as recommended by manufacturer, except as otherwise indicated.
- .3 For deck openings with any one dimension greater than 300 mm and for areas of concentrated load, reinforce in accordance with structural framing details, except as otherwise indicated.

3.5 CONNECTIONS

- .1 Install connections in accordance with CSSBI recommendations as indicated.

END OF SECTION

Part 1 General

1.1 REFERENCES

- .1 American Society for Testing and Materials International, (ASTM)
 - .1 ASTM A653/A653M-11, Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.
 - .2 ASTM A53/A53M-07, Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated Welded and Seamless.
 - .3 ASTM A307-07b, Specification for Carbon Steel Bolts and Studs, 60,000 PSI Tensile Strength.
- .2 Canadian General Standards Board (CGSB)
 - .1 CAN/CGSB-1.40-97, Anti-corrosive Structural Steel Alkyd Primer.
 - .2 CAN/CGSB-1.181-99, Ready-Mixed, Organic Zinc-Rich Coating.
- .3 Canadian Standards Association (CSA International)
 - .1 CAN/CSA-G40.20/G40.21-04(R2009), General Requirements for Rolled or Welded Structural Quality Steel.
 - .2 CAN/CSA-S16.1-94(R2000), Limit States Design of Steel Structures.
 - .3 CSA W48-06(R2011), Filler Metals and Allied Materials for Metal Arc Welding (Developed in co-operation with the Canadian Welding Bureau).
 - .4 CSA W59-03 (R2008), Welded Steel Construction (Metal Arc Welding) (Imperial Version).

1.2 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Submit submittals in accordance with Section 01 33 00.
- .2 Product Data:
 - .1 Submit manufacturer's printed product literature, specifications and data sheet
 - .2 Submit two copies of WHMIS MSDS - Material Safety Data Sheets in accordance with Section 01 00 01. Indicate VOCs, for finishes, coatings, primers and paints.
- .3 Shop Drawings: Indicate materials, core thicknesses, finishes, connections, joints, method of anchorage, number of anchors, supports, reinforcement, details, and accessories.

1.3 QUALITY ASSURANCE

- .1 Certificates: Upon request provide product certificates signed by manufacturer certifying materials comply with specified performance characteristics and criteria and physical requirements.
- .2 Pre-installation Meetings: Conduct pre-installation meeting to verify project requirements, manufacturer's installation instructions and manufacturer's warranty requirements.

1.4 DELIVERY, STORAGE, AND HANDLING

- .1 Deliver, store, handle and protect materials in accordance with Section 01 60 00.

Part 2 Products

2.1 MATERIALS

- .1 Steel sections and plates: to CAN/CSA-G40.20/G40.21, Grade 350W.
- .2 Steel pipe: to ASTM A53/A53M standard weight, black, galvanized finish as indicated.
- .3 Ladders: ANSI A14.3
- .4 Welding materials: to CSA W59.
- .5 Welding electrodes: to CSA W48 Series.
- .6 Bolts and anchor bolts: to ASTM A307.
- .7 Shop and touch-up primer: red oxide.
- .8 Grout: non-shrink, non-metallic, flowable, 15 MPa at 24 hours.

2.2 FABRICATION

- .1 Fabricate work square, true, straight and accurate to required size, with joints closely fitted and properly secured.

- .2 Use self-tapping shake-proof screws on items requiring assembly by screws or as indicated.
- .3 Exposed mechanical fastenings: Flush countersunk screws or bolts; unobtrusively located; consistent with design of component, except where specifically noted otherwise.
- .4 Where possible, fit and shop assemble work, ready for erection.
- .5 Ensure exposed welds are continuous for length of each joint. File or grind exposed welds smooth and flush. Grind welds of stainless steel smooth and flush; polish to match adjacent surfaces.
- .6 Supply components required for anchorage of fabrications. Fabricate anchors and related components of same material and finish as fabrication, except where specifically noted otherwise.

2.3 FINISHES

- .1 Galvanizing: hot dipped galvanizing with zinc coating 600 g/m² to ASTM A653/A653M.
- .2 Shop coat primer: to CAN/CGSB-1.40.
- .3 Zinc primer: zinc rich, ready mix to CAN/CGSB-1.181.

2.4 SHOP PAINTING

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

2.5 LIST OF PRINCIPLE ITEMS

- .1 Items 2.6 to 2.8 are principle items only. Refer to Drawing details for items not specifically listed.

2.6 ANGLE LINTELS

- .1 Steel angles: galvanized finish for exterior, prime painted for interior, sizes indicated for openings. Provide 150 mm minimum bearing at ends.
- .2 Weld or bolt back-to-back angles to profiles as indicated.

2.7 BOLLARDS

- .1 Steel pipe: size and length as indicated, crowned cap, prime paint above concrete.

2.8 ELEVATOR HOIST BEAM

- .1 Steel sections and plates: to CAN/CSA-G40.20/G40.21, Grade 300W.
- .2 Beam designed by structural Engineer licensed in the Province of Manitoba.

Part 3 Execution

3.1 ERECTION

- .1 Do welding work in accordance with CSA W59 unless specified otherwise.
- .2 Erect metalwork square, plumb, straight, and true, accurately fitted, with tight joints and intersections.
- .3 Provide suitable means of anchorage acceptable to such as dowels, anchor clips, bar anchors, expansion bolts and shields, and toggles.
- .4 Exposed fastening devices to match finish and be compatible with material through which they pass.
- .5 Provide components for building by other sections in accordance with shop drawings and schedule.
- .6 Make field connections with bolts to CAN/CSA-S16.1, or weld.

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- .7 Hand items over for casting into concrete or building into masonry to appropriate trades together with setting templates.
 - .8 Touch-up field welds, bolts and burnt or scratched surfaces after completion of erection with primer.
 - .9 Touch-up galvanized surfaces with zinc rich primer where burned by field welding.
- 3.2 ANGLE LINTELS**
- .1 Install lintels in locations as indicated.
- 3.3 BOLLARDS**
- .1 Install bollards in locations as indicated.
- 3.4 SITE PAINTING**
- .1 Paint non galvanized metal fabrications to Section 09 90 00.
- 3.5 CLEANING**
- .1 Perform cleaning after installation to remove construction and accumulated environmental dirt.
 - .2 Upon completion of installation, remove surplus materials, rubbish, tools and equipment barriers.

END OF SECTION

Part 1 General

1.1 REFERENCES

- .1 American Society for Testing and Materials International, (ASTM)
 - .1 ASTM A53/A53M-10, Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated Welded and Seamless.
 - .2 ASTM A307-10, Specification for Carbon Steel Bolts and Studs, 60,000 PSI Tensile Strength.
 - .3 ASTM A325M-09, Specification for Structural Bolts, Steel, Heat Treated, 120/105 ksi Minimum Tensile Strength.
- .2 Canadian General Standards Board (CGSB)
 - .1 CAN/CGSB-1.40-97, Anti-corrosive Structural Steel Alkyd Primer.
 - .2 CAN/CSA-G40.20/G40.21-04(R2009), General Requirements for Rolled or Welded Structural Quality Steel.
- .3 Canadian Standards Association (CSA International)
 - .1 CSA W59-03 (R2008), Welded Steel Construction (Metal Arc Welding/Imperial Version).
- .4 National Association of Architectural Metal Manufacturers (NAAMM)
 - .1 AMP 510-92, Metal Stair Manual.
- .5 Steel Structures Painting Council (SSPC), Systems and Specifications Manual, Volume 2.

1.2 DESIGNER QUALIFICATIONS

- .1 Design Engineer to have Professional Liability Insurance.
- .2 Retain a qualified professional engineer who is licensed in the Province of Manitoba to design in accordance with reference Standards and inspect Work during construction.
- .3 Design Engineer to ensure the design in according to the requirements of the Manitoba Building Code and other specified criteria, and be responsible under the Building Code Act for general review of construction for the portion of the work prepared under their professional seals.

1.3 SYSTEM DESCRIPTION

- .1 Design metal stair, handrail and landing construction and connections to MBC vertical and horizontal live load requirements.
- .2 Detail and fabricate stairs to NAAMM Metal Stairs Manual.

1.4 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Submit submittals in accordance with Section 01 33 00.
- .2 Product Data:
 - .1 Submit manufacturer's printed product literature, specifications and data sheet
 - .2 Submit two copies of WHMIS MSDS - Material Safety Data Sheets in accordance with Section 01 33 00. Indicate VOCs, for finishes, coatings, primers and paints.
- .3 Shop Drawings
 - .1 Indicate construction details, sizes of steel sections and thickness of steel sheet.
 - .2 Submit shop drawing bearing stamp of a qualified professional engineer registered in Province of Manitoba.
- .4 Inspection reports: submit by design engineer reports stamped and signed verifying satisfactory installation and the work has been completed in accordance with the drawings, specifications and shop drawings.

1.5 QUALITY ASSURANCE

- .1 Certificates: Upon Request submit product certificates signed by manufacturer certifying materials comply with specified performance characteristics and criteria and physical requirements.
- .2 Pre-installation Meetings: Conduct pre-installation meeting to verify project requirements, manufacturer's installation instructions and manufacturer's warranty requirements.

Part 2**Products****2.1****MATERIALS**

- .1 Stainless steel type 304.
- .2 Steel sections: to CAN/CSA-G40.20/G40.21 Grade 300 W.
- .3 Steel plate: to CAN/CSA-G40.20/G40.21, Grade 300 W.
- .4 Floor plate: to CAN/CSA-G40.20/G40.21, Grade 300 W.
- .5 Steel pipe: to ASTM A53/A53M, standard weight, schedule 40 seamless black.
- .6 Steel tubing: to CAN/CSA-G40.20/G40.21, sizes and dimensions as indicated.
- .7 Welding materials: to CSA W59.
- .8 Bolts: to ASTM A307.
- .9 High strength bolts: to ASTM A325M.

2.2**FABRICATION**

- .1 Fabricate to NAAMM, Metal Stair Manual.
- .2 Weld connections where possible, otherwise bolt connections. Countersink exposed fastenings, cut off bolts flush with nuts. Make exposed connections of same material, colour and finish as base material on which they occur.
- .3 Accurately form connections with exposed faces flush; mitres and joints tight. Make risers of equal height.
- .4 Grind or file exposed welds and steel sections smooth.
- .5 Shop fabricate stairs in sections as large and complete as practicable.

2.3**STAINLESS STEEL RAILINGS FOR GLAZING PANELS**

- .1 Fabricate to details as indicated
- .2 Acceptable manufacturer: C R Laurance.
- .3 Glazing to Section 08 80 50.

2.4**PROTECTIVE STEEL RAILINGS**

- .1 Flat bar 75 mm x 6 mm thick
- .2 Fabricate to details as indicated.
- .3 Paint finish.

2.5**STEEL PAN STAIRS**

- .1 Fabricate stairs with closed riser steel pan construction.
- .2 Form treads and risers from steel plate. Secure treads and risers to angle horizontal and vertical welded to stringers.
- .3 Form landings from steel plate, reinforced by angles.
- .4 Provide clip angles for fastening of furring channels, where applied finish is indicated for underside of stairs and landings.
- .5 Extend stringers around mid landings to form steel base.
- .6 Close ends of stringers where exposed.

2.6**PIPE/TUBING BALUSTRADES FOR HANDRAILS**

- .1 Steel pipe/tubing handrail and supports as indicated.
- .2 Cap and weld exposed ends of balusters and handrails.
- .3 Terminate at abutting wall with end flange.

2.7**FINISHES**

- .1 Shop coat primer: to CAN/CGSB-1.40.
- .2 Stainless steel.

2.8**SHOP PAINTING**

- .1 Clean surfaces in accordance with Steel Structures Painting Council Manual Volume 2.

- .2 Apply one coat of shop primer except interior surfaces of pans.
- .3 Apply two coats of primer of different colours to parts inaccessible after final assembly.
- .4 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 degrees C.
- .5 Do not paint surfaces to be field welded.

Part 3 Execution

3.1 INSTALLATION OF STAIRS

- .1 Install in accordance with NAAMM, Metal Stair Manual.
- .2 Install plumb and true in exact locations, using welded connections wherever possible to provide rigid structure. Provide anchor bolts, bolts and plates for connecting stairs to structure.
- .3 Hand items over for casting into concrete or building into masonry to appropriate trades together with setting templates.
- .4 Do welding work in accordance with CSA W59 unless specified otherwise.
- .5 Touch up shop primer to bolts, welds, and burned or scratched surfaces at completion of erection.
- .6 Touch up stainless steel.

3.2 INSTALLATION OF HANDRAILS, PROTECTIVE RAILS

- .1 Install plumb and true in exact locations, using welded connections wherever possible to provide rigid structure. Provide anchor bolts, bolts and plates for connecting handrails to structure.
- .2 Hand items over for casting into concrete or building into masonry to appropriate trades together with setting templates.
- .3 Do welding work in accordance with CSA W59 unless specified otherwise.
- .4 Touch up shop primer to bolts, welds, and burned or scratched surfaces at completion of erection.

3.3 INSTALAIION STAINLESS STEEL HANDRAILS

- .1 Install plumb and true in exact locations, using connections to provide rigid structure. Provide anchor bolts, bolts and plates for connecting handrails to structure.

3.4 CLEANING

- .1 Perform cleaning as soon as possible after installation to remove construction and accumulated environmental dirt.
- .2 Upon completion of installation, remove surplus materials, rubbish, tools and equipment barriers.

END OF SECTION

Part 1 General

1.1 REFERENCES

- .1 American Society for Testing and Materials International, (ASTM)
 - .1 ASTM A653/A653M-11, Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.
- .2 Canada Green Building Council (CaGBC)
 - .1 LEED Canada-NC Version 1.0-2004, LEED (Leadership in Energy and Environmental Design): Green Building Rating System for New Construction and Major Renovations (including Addendum 2007).
 - .2 LEED Canada-NC-2009, LEED (Leadership in Energy and Environmental Design): Green Building Rating System for New Construction and Major Renovations 2009.
- .3 Canadian General Standards Board (CGSB)
 - .1 CAN/CGSB-71.26-M88, Adhesive for Field-Gluing Plywood to Lumber Framing for Floor Systems.
- .4 Canadian Standards Association (CSA)
 - .1 CSA B111-1974(R2003), Wire Nails, Spikes and Staples.
 - .2 CSA O121-08, Douglas Fir Plywood.
 - .3 CAN/CSA-O141-05(R2009), Softwood Lumber.
 - .4 CSA O151-09, Canadian Softwood Plywood.
 - .5 CSA O437 Series-93(R2011), Standards on OSB and Waferboard.
- .5 Forest Stewardship Council (FSC)
 - .1 FSC-STD-01-001-2004, FSC Principle and Criteria for Forest Stewardship.
- .6 National Lumber Grades Authority (NLGA)
 - .1 Standard Grading Rules for Canadian Lumber 2010.

1.2 QUALITY ASSURANCE

- .1 Lumber by grade stamp of an agency certified by Canadian Lumber Standards Accreditation Board.
- .2 Plywood, particleboard, OSB and wood based composite panels in accordance with CSA and ANSI standards.

1.3 CO-ORDINATION

- .1 Contractor to supply and install all blocking required for millwork, built in furniture, and equipment supplied and installed by others.
- .2 Co-ordinate with Section 07 27 10 Air/Vapour Barriers to provide an overlap and continuous seal to ensure continuity of building envelope air/vapour barrier and rain screen principles.

1.4 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Submit submittals in accordance with Section 01 33 00.
- .2 Submit written approval from flooring manufacturer subfloor underlayment is acceptable.
- .3 Sustainable Design Submittals: LEED Canada submittals: in accordance with Section 01 47 15.

1.5 DELIVERY, STORAGE AND HANDLING

- .1 Deliver, store and handle materials in accordance with Section 01 61 00 - Common Product Requirements and with manufacturer's written instructions.
- .2 Packaging Waste Management: remove for reuse and return by manufacturer of pallets, crates, padding, and packaging materials as specified in Construction Waste Management Plan, Waste Reduction Workplan in accordance with Section 01 74 19 - Construction/Demolition Waste Management and Disposal and Section 01 47 15.

Part 2 Products

2.1 FRAMING AND STRUCTURAL MATERIALS

- .1 Lumber: unless specified otherwise, softwood, S4S, moisture content 19% (S-dry) or less in accordance with following standards:
 - .1 CAN/CSA-O141.
 - .2 NLGA Standard Grading Rules for Canadian Lumber.
- .2 Exterior steps, landings, joists, stringers, railings, posts and stops: pressure treated lumber.
- .3 Framing and board lumber: in accordance with NBC.
- .4 Furring, blocking, nailing strips, grounds, rough bucks, cants, curbs, fascia backing and sleepers:
 - .1 S2S is acceptable for all work.
 - .2 Board sizes: "Standard" or better grade.
 - .3 Dimension sizes: "Standard" light framing or better grade.
 - .4 Post and timbers sizes: "Standard" or better grade

2.2 PANEL MATERIALS

- .1 Douglas fir plywood (DFP): to CSA O121, standard construction.
- .2 Canadian softwood plywood (CSP): to CSA O151, standard construction.
- .3 Plywood, OSB and wood based composite panels: to CAN/CSA-O325.0.

2.3 ACCESSORIES

- .1 General purpose adhesive: to CSA O112 Series.
- .2 Adhesive for Field-Gluing Plywood to Lumber Framing for Floor Systems to CAN/CGSB-71.26-M88
- .3 Nails, spikes and staples: to CSA B111.
- .4 Bolts: 12.5 mm diameter unless indicated otherwise, complete with nuts and washers.
- .5 Proprietary fasteners: toggle bolts, expansion shields and lag bolts, screws and lead or inorganic fibre plugs, explosive actuated fastening devices, recommended for purpose by manufacturer.

2.4 FASTENER FINISHES

- .1 Galvanizing: to ASTM A653/A653M, use galvanized fasteners for exterior work, interior highly humid areas, pressure-preservative, and fire-retardant, treated lumber.

Part 3 Execution

3.1 PREPARATION

- .1 Treat pressure treated wood cut surfaces with wood preservative, before installation as indicated and as follows:
 - .1 Pressure treated wood: treat all cut surfaces.

3.2 INSTALLATION

- .1 Comply with requirements of NBC 2010 supplemented by following paragraphs.
- .2 Install members true to line, levels and elevations, square and plumb.
- .3 Construct continuous members from pieces of longest practical length.
- .4 Install furring and blocking as required to space-out and support casework, cabinets, wall and ceiling finishes, facings, fascia, soffit, siding electrical equipment mounting boards, and other work as required.
- .5 Install rough bucks, nailers and linings to rough openings as required to provide backing for frames and other work.
- .6 Install steps, railings, wood cants, fascia backing, nailers, curbs and other wood supports as required and secure using galvanized steel fasteners.
- .7 Use dust collectors and high quality respirator masks when cutting or sanding wood panels.

3.3

ERECTION

- .1 Frame, anchor, fasten, tie and brace members to provide necessary strength and rigidity.
- .2 Countersink bolts where necessary to provide clearance for other work.
- .3 Use nailing disks for soft sheathing as recommended by sheathing manufacturer.

3.4

SCHEDULES

- .1 Interior sheathing: OSB sheathing, square edge, thickness as indicated
- .2 Electrical equipment mounting boards: Plywood, DFP or CSP sheathing grade, square edge 19 mm thick.

END OF SECTION

Part 1 General

1.1 REFERENCES

- .1 AWMAC Architectural Woodwork Standards Edition 1 2009.
- .2 Canada Green Building Council (CaGBC)
 - .1 LEED Canada-NC Version 1.0-2004, LEED (Leadership in Energy and Environmental Design): Green Building Rating System for New Construction and Major Renovations (including Addendum 2007).
 - .2 LEED Canada-NC-2009, LEED (Leadership in Energy and Environmental Design): Green Building Rating System for New Construction and Major Renovations 2009.
- .3 Forest Stewardship Council (FSC)
 - .3 FSC-STD-01-001-2004, FSC Principle and Criteria for Forest Stewardship.

1.2 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Submit submittals in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Sustainable Design Submittals: LEED Canada submittals: in accordance with Section 01 47 15.
- .3 Shop drawings: Indicate details of construction, profiles, jointing, fastening and other related details.
 - .1 Scales: profiles, details 1/2 full size.
 - .2 Indicate materials, thicknesses, finishes and hardware.
 - .3 Indicate locations of service outlets in casework, typical and special installation conditions, and connections, attachments, anchorage and location of exposed fastenings.
- .4 Submit duplicate colour samples of laminated plastic for colour selection.
- .5 Submit duplicate samples of laminated plastic joints, edging, cutouts and postformed profiles.

1.3 DELIVERY, STORAGE, AND HANDLING

- .1 Deliver, handle, store and protect materials of this section in accordance with Section 01 60 00.
- .2 Protect millwork against dampness and damage during and after delivery.
- .3 Store millwork in ventilated areas, protected from extreme changes of temperature or humidity.
- .4 Packaging Waste Management: remove for reuse and return by manufacturer of pallets, crates, padding, and packaging materials as specified in Construction Waste Management Plan, Waste Reduction Workplan in accordance with Section 01 74 19 - Construction/Demolition Waste Management and Disposal and Section 01 47 15.

Part 2 Products

2.1 MATERIALS

- .1 Softwood lumber: unless specified otherwise, S4S, moisture content 7 % or less in accordance with following standards:
 - .1 AWMAC custom grade, moisture content as specified.
- .2 Hardwood lumber: moisture content 7 % or less in accordance with following standards:
 - .1 AWMAC custom grade, moisture content as specified.
- .3 Plywood: to AWMAC custom grade.
- .4 Hardboard: AWMAC custom grade.
- .5 MDF (medium density fibreboard) core: to AWMAC custom grade, thickness as indicated, density 769 kg/m².
- .6 Laminated plastic for flatwork and vertical surfaces: to NEMA LD3, Grade VGL, Type S, 1.27 mm thick; based on solid colour range .
- .7 Laminated plastic backing sheet: Grade BK, Type S not less than 0.5 mm thick or same

- thickness and colour as face laminate.
- .8 Laminated plastic liner sheet: Grade GP, Type S, colour to be selected by Construction Manager.
- .9 Thermofused Melamine: to NEMA LD3 Grade VGL.
 - .1 High wear resistant thermofused melamine: equal or exceed 400 cycles (Minimum standard for HPL abrasion test).
- .10 Nails and staples: to CSA B111.
- .11 Wood screws steel plated, type and size to suit application.
- .12 Splines: manufacturer's standard wood, plastic, or metal.
- .13 Sealant: in accordance with Section 07 92 00.
- .14 Laminated plastic adhesive: to CSA Standards and to laminate manufacturer recommendations.

2.2 MANUFACTURED UNITS

- .1 Casework.
 - .1 Fabricate caseworks to AWMAC custom quality grade.
 - .2 Furring, blocking, nailing strips, grounds and rough bucks and sleepers.
 - .1 Board sizes: "Standard" or better grade.
 - .2 Dimension sizes: "Standard" light framing or better grade.
 - .3 Case bodies (ends, divisions and bottoms)
 - .1 MDF, 19 mm thickness.
 - .2 Laminated plastic: as indicated, grade and type as specified.
 - .3 Interior: melamine thickness and colour as indicated.
 - .4 Backs
 - .1 Melamine: thickness and colour as indicated.
 - .2 Hardboard 6 mm thickness.
 - .5 Shelving for cabinets with doors.
 - .1 MDF laminated 19 mm thickness.
 - .2 Laminated plastic: as indicated, grade and type as specified.
 - .3 Edge banding: laminated plastic all exposed edges.
 - .6 Shelving exposed:
 - .1 MDF laminated 19 mm thickness.
 - .2 Laminated plastic: as indicated, grade and type as specified.
 - .3 Edge banding: laminated plastic all exposed edges.
 - .7 Drawers
 - .1 Fabricate drawers to AWMAC custom grade supplemented as follows:
 - .2 Sides and Backs, bottoms:
 - .1 Melamine: 19 mm thick, interior, white.
 - .2 Edge banding: Melamine all exposed edges.
 - .3 Laminated plastic as indicated.
 - .1 Edge banding: laminated plastic all exposed edges.
 - .3 Fronts
 - .1 MDF 19 mm thick.
 - .2 Laminated plastic: grade and type as specified.
 - .3 Edge banding: laminated plastic all exposed edges.
 - .8 Doors:
 - .1 Fabricate doors to AWMAC custom grade supplemented as follows:
 - .1 MDF 19 mm thickness.
 - .2 Laminated plastic: grade and type as specified.
 - .3 Laminated all exposed surfaces.
 - .4 Melamine: interior, white.
 - .5 Interior: Laminated plastic as indicated.

- .9 Countertops and Backsplash
 - .1 Fabricate caseworks to AWMAC custom quality grade.
 - .1 Laminated plastic: grade and type specified, bullnose edge postformed.
 - .2 All exposed surfaces laminated.
 - .3 Core 19 mm thick, MDF, fir plywood as indicated.
 - .4 Adhesive: as recommended by laminate manufacturer.

2.6 FABRICATION

- .1 Set nails and countersink screws apply wood filler to indentations, sand smooth and leave ready to receive finish.
- .2 Shop install cabinet hardware for doors, shelves and drawers. Recess shelf standards
- .3 unless noted otherwise.
- .4 Shelving to cabinetwork to be adjustable unless otherwise noted.
- .5 Provide cutouts for plumbing fixtures, inserts, appliances, outlet boxes and other fixtures.
- .6 Shop assemble work for delivery to site in size easily handled and to ensure passage
- .7 through building openings.
- .8 Obtain governing dimensions before fabricating items which are to accommodate or abut
- .9 appliances, equipment and other materials.
- .10 Ensure adjacent parts of continuous laminate work match in colour and pattern.
- .11 Veneer laminated plastic to core material in accordance with adhesive manufacturer's instructions. Ensure core and laminate profiles coincide to provide continuous support and bond over entire surface. Use continuous lengths up to 2400 mm. Keep joints 600 mm from sink cutouts.
- .12 Form shaped profiles and bends as indicated, using post forming grade laminate to
- .13 laminate manufacturer's instructions.
- .14 Use straight self-edging laminate strip for flatwork to cover exposed edge of core material. Chamfer exposed edges uniformly at approximately 20 degrees. Do not mitre laminate edges.
- .15 Apply laminate backing sheet to reverse side of core of plastic laminate work.
- .16 Apply laminated plastic liner sheet to interior of cabinetry where indicated.

Part 3 Execution

3.1 INSTALLATION

- .1 Do architectural woodwork to Quality Standards of the Architectural Woodwork Manufacturers Association of Canada (AWMAC), except where specified otherwise.
- .2 Install prefinished millwork at locations shown on drawings. Position accurately, level, plumb straight.
- .3 Fasten and anchor millwork securely. Provide heavy duty fixture attachments for wall mounted cabinets.
- .4 Use draw bolts in countertop joints.
- .5 Scribe and cut as required to fit abutting walls and to fit properly into recesses and to accommodate piping, columns, fixtures, outlets or other projecting, intersecting or penetrating objects.
- .6 Apply water resistant building paper over wood framing members in contact with masonry or cementitious construction.
- .7 Fit hardware accurately and securely in accordance with manufacturer's written instructions.

3.2 INSTALLATION LAMINATES

- .1 Install work plumb, true and square, neatly scribed to adjoining surfaces.
- .2 Make allowances around perimeter where fixed objects pass through or project into laminated plastic work to permit normal movement without restriction.

- .3 Use draw bolts and splines in countertop joints. Maximum spacing 450 mm oc, 75 mm from edge. Make flush hairline joints.
- .4 Provide cutouts for inserts, grilles, appliances, outlet boxes and other penetrations. Round internal corners, chamfer edges and seal exposed core.
- .5 At junction of laminated plastic counter back splash and adjacent wall finish, apply small bead of sealant.

3.3 **CLEANING**

- .1 Clean millwork and cabinet work inside cupboards and drawers, and outside surfaces.

3.4 **PROTECTION**

- .1 Protect millwork and cabinet work from damage until final inspection.

3.5 **SCHEDULE**

- .1 MFD: West Pine Eco Gold No added urea formaldehyde
- .2 Plywood: Roseburg Sky-Ply No added urea formaldehyde
- .3 Laminated plastic for flatwork and vertical surfaces: to NEMA LD3, Grade VGL, Type S.
 - .1 Manufacturer: Wilsonart FSC certified
 - .2 Colours: Allow up to six colours as selected from manufacturer's standard range of patterns and textures as selected by Construction Manager

END OF SECTION

PART 1 GENERAL

1.1 REFERENCES

- .1 ASTM C 367 - Standard Test Methods for Strength Properties of Prefabricated Architectural Acoustical Tile or Lay-In Ceiling Panels.
- .2 ASTM D 3841 - Standard Specification for Glass-Fiber-Reinforced Polyester Plastic Panels.
- .3 ASTM E 84 - Surface Burning Characteristics of Building Materials.
- .4 ICC Evaluation Service ES Report ESR-2364.

1.2 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Submit submittals in accordance with Section 01 33 00.
- .2 Product Data: Submit manufacturer's product data, including installation instructions.
- .3 Samples: Submit manufacturer's samples.
 - .1 Color Samples: Standard and special colors.
 - .2 Liner Panels: Minimum 4 inches by 4 inches.
 - .3 Moldings: Each type specified.
 - .4 Fasteners: Each type specified.
- .4 Manufacturer's Certification:
 - .1 Submit manufacturer's certification that materials comply with specified requirements and are suitable for intended application.
- .5 Warranty: Submit manufacturer's standard warranty.

1.3 QUALITY ASSURANCE

- .1 Manufacturer's Qualifications: FRP panels and moldings originate from the same manufacturer

1.4 DELIVERY, STORAGE, AND HANDLING

- .1 Storage:
 - .1 Store liner panels in clean, cool, dry, well-ventilated area indoors in accordance with manufacturer's instructions.
 - .2 Store liner panels flat.
 - .3 Stack panels on skids a maximum of 5 skids high.
 - .4 Do not allow moisture to collect on or in-between panels.
 - .5 Protect materials and finish from damage during handling and installation in accordance with manufacturer's instructions.

1.7 WARRANTY

- .1 Liner Panel Warranty Period: Ten years from date of final acceptance.

PART 2 PRODUCTS

2.1 FRP LINER PANELS

- 1. Liner Panels:
 - .1 Conformance: ASTM D 3841.
- .2 Approval:
 - .1 ICC ES Report ESR-2364.
 - .2 CFIA
 - .3 ASTM E 84 tested and listed by Factory Mutual, Reports JI 3005041, 3001891, and 3005799.
- .3 Nominal Thickness.075"
- .4 Dimensions: as indicated
- .5 Finish: smooth and to match existing..
- .6 Color: One colour as selected by Construction Manager from manufacturer's standard range.

- .7 Wall covering shall be UL Tested, classified and labelled reflecting a Class1 Fire Rating in accordance with UL 723 (ASTM-E84-91a) test procedures
- .8 Chemical and Stain Resistance shall be per ASTM D-1308, Method B

2.2 ACCESSORIES

- .1 Moldings: PVC, same manufacturer and color as liner panels.
 - 1. Dividers.
 - 2. Outside corners.
 - 3. Inside corners.
 - 4. End caps.
 - 5. Angles.
- .2 Fasteners: Nylon rivets, 1-piece, non-corroding, same manufacturer and color as liner panels.
- .3 Silicone Sealant: As specified in Section 07 92 00 .
- .4 Adhesive: Water-based or solvent-based adhesive, compatible with FRP liner panels.

PART 3 EXECUTION

3.1 EXAMINATION

- .1 Examine areas to receive liner panels. Notify Construction Manager of conditions that would adversely affect installation or subsequent use. Do not proceed with installation until unsatisfactory conditions are corrected.

3.2 PREPARATION

- .1 Ensure solid ceiling surfaces to receive liner panels are plumb, clean, flat, smooth, and dry.
- .2 Precondition liner panels before installation in accordance with manufacturer's instructions.

3.3 INSTALLATION

- .1 Install liner panels in accordance with manufacturer's instructions.
- .2 Install liner panels over plumb, clean, flat, smooth, dry, solid wall surfaces.
- .3 Install liner panels plumb, level, square, and in proper alignment.
- .4 Lay out liner panels to minimize joints. Use full panels where possible.
- .5 Cut liner panels in accordance with manufacturer's instructions for proper installation.
- .6 Expansion and Contraction:
 - 1. Install liner panels with gap at ceiling, floor, and between panels in accordance with manufacturer's instructions to allow for expansion and contraction of panels due to changes in temperature.
 - 2. Allow for expansion and contraction of liner panels when pre-drilling holes for fasteners and when installing around penetrations, including pipes, conduits, and electrical outlets.
- .7 Moldings and Sealants:
 - 1. Install moldings and silicone sealant with liner panels in accordance with manufacturer's instructions to achieve moisture-resistant installation.
 - 2. Remove excess silicone sealant during installation or trim after silicone has cured.
- .8 Adhesive: Apply adhesive in accordance with manufacturer's instructions along with fasteners when installing liner panels.
- .9 Fasteners: Install liner panels with non-corroding fasteners. Use fastener type and size as required for installation.

3.4 CLEANING

- .1 Clean liner panels promptly after installation in accordance with manufacturer's instructions.
- .2 Do not use harsh or abrasive cleaning materials or methods that would damage liner panels or finish.

3.5 PROTECTION

- .1 Protect installed liner panels and finish from damage during construction.

99% REVIEW

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END OF SECTION

Part 1 General

1.1 REFERENCES

- .1 Underwriters Laboratories of Canada (ULC)
 - .1 CAN/ULC-S701-11, Standard for Thermal Insulation, Polystyrene, Boards and Pipe Coverings.
- .2 Health Canada/Workplace Hazardous Materials Information System (WHMIS)
 - .1 Material Safety Data Sheets (MSDS).

1.2 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Product Data: Submit manufacturer's printed product literature, specifications and data sheet.
- .2 Submit manufacturer's installation instructions.
- .3 Sustainable Design Submittals: LEED Canada submittals: in accordance with Section 01 47 15.

1.3 DELIVERY, STORAGE AND HANDLING

- .1 Deliver, store and handle materials in accordance with Section 01 61 00 - Common Product Requirements and with manufacturer's written instructions.
- .2 Packaging Waste Management: remove for reuse and return by manufacturer of pallets, crates, padding, and packaging materials as specified in Construction Waste Management Plan, Waste Reduction Workplan in accordance with Section 01 74 19 - Construction/Demolition Waste Management and Disposal and Section 01 47 15.

Part 2 Products

2.1 INSULATION

- .1 Foundation wall/grade beam, under concrete slab: extruded polystyrene board Type 4, rigid closed cell type .
 - .1 Thermal resistance: RSI value 0.87/25 mm to ASTM C518
 - .2 Board size: 610 x 1220 mm, 50 mm thick.
 - .3 Compressive strength: to ASTM D1621, minimum 210 kPa.

2.2 ACCESSORIES

- .1 Tape: as recommend by manufacturer.
- .2 Fasteners: as recommended by manufacturer.

Part 3 Execution

3.1 MANUFACTURER'S INSTRUCTIONS

- .1 Compliance: comply with manufacturer's written data, including product technical bulletins, product catalogue installation instructions, product carton installation instructions, and data sheets.

3.2 WORKMANSHIP

- .1 Install insulation after building substrate materials are dry.
- .2 Install insulation to maintain continuity of thermal protection to building elements and spaces.
- .3 Cut and trim insulation neatly to fit spaces. Butt joints tightly, offset vertical joints. Use only insulation boards free from chipped or broken edges. Use largest possible dimensions to reduce number of joints.
- .4 Do not enclose insulation until it has been inspected and approved by Consultant.

3.3 EXAMINATION

- .1 Examine substrates and immediately inform Construction Manager in writing of defects.
- .2 Prior to commencement of work ensure:
 - .1 Substrates are firm, straight, smooth, dry, free of snow, ice or frost, and clean of dust and debris.

3.4 PERIMETER UNDER SLAB INSTALLATION

- .1 Apply Tape over all joints to insulation board in accordance with manufacturer's recommendations.
- .2 Leave insulation board joints unbonded over line of expansion and control joints. Bond a continuous 150 mm wide 0.15 mm modified bituminous membrane over expansion and control joints using compatible adhesive and primer before application of insulation.

3.5 PERIMETER FOUNDATION INSTALLATION

- .1 Install on foundation wall with fasteners as recommended by manufacturer.
- .2 Extend boards as indicated on grade.
- .3 Install cement board with fasteners as recommended by manufacturer

3.6 CLEANING

- .1 Upon completion of installation, remove surplus materials, rubbish, tools and equipment barriers.

END OF SECTION

Part 1 General

1.1 REFERENCES

- .1 Underwriters Laboratories of Canada (ULC).
 - .1 CAN/ULC-S702-09, Standard for Mineral Fibre Insulation.

1.2 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Product Data: Submit manufacturer's printed product literature, specifications and data sheets.
- .2 Sustainable Design Submittals: LEED Canada submittals: in accordance with Section 01 47 15.

1.3 DELIVERY, STORAGE AND HANDLING

- .1 Deliver, store and handle materials in accordance with Section 01 61 00 - Common Product Requirements and with manufacturer's written instructions.
- .2 Packaging Waste Management: remove for reuse and return by manufacturer of pallets, crates, padding, and packaging materials as specified in Construction Waste Management Plan, Waste Reduction Workplan in accordance with Section 01 74 19 - Construction/Demolition Waste Management and Disposal and Section 01 47 15.

Part 2 Products

2.1 INSULATION

- .1 Batt and blanket mineral fibre: to CAN/ULC S702, Type 1 (friction fit), thickness and/or RSI as indicated.
- .2 Batt and blanket acoustic mineral fibre: glass fibre to CAN/ULC-S702, Type 1 (friction fit), acoustic batt, thickness as indicated.

Part 3 Execution

3.1 MANUFACTURER'S INSTRUCTIONS

- .1 Compliance: comply with manufacturer's written data, including product technical bulletins, product catalogue installation instructions, product carton installation instructions, and data sheets.

3.2 INSULATION INSTALLATION

- .1 Install insulation to maintain continuity of thermal and or acoustic to building elements and spaces.
- .2 Fit insulation closely around electrical boxes, pipes, ducts, frames and other objects in or passing through insulation.
- .3 Do not compress insulation to fit into spaces.
- .4 Keep insulation minimum 25 mm from heat emitting devices such as recessed light fixtures.
- .5 Do not enclose insulation until it has been inspected and approved by Consultant.

END OF SECTION

Part 1 General

1.1 REFERENCES

- .1 Canadian General Standards Board (CGSB)
 - .1 CAN/CGSB-51.33-M89, Vapour Barrier Sheet, Excluding Polyethylene, for Use in Building Construction.
 - .2 CAN/CGSB-51.34-M86, Vapour Barrier, Polyethylene Sheet, for Use in Building Construction.

1.2 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Provide submittals in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Product Data:
 - .1 Submit manufacturer's printed product literature, specifications and datasheet and include:
 - .1 Product characteristics.
 - .2 Performance criteria.
 - .3 Limitations.
 - .3 Submit two copies of Workplace Hazardous Materials Information System (WHMIS) Material Safety Data Sheets (MSDS).
 - .4 LEED Documentation: .1 Submit a LEED Material Submittal Form to identify recycled content, regional content or VOC emission when required by Submittal Requirements.

1.3 QUALITY ASSURANCE

- .1 Health and Safety Requirements: do construction occupational health and safety in accordance with Section [01 35 29 Health and Safety Requirements.

1.4 DELIVERY, STORAGE AND HANDLING

- .1 Deliver, store and handle in accordance with Section 01 61 00 – Common Product Requirements and manufacturer's written instructions.
- .2 Deliver materials to the site in undamaged condition and in original unopened containers, marked to indicate brand name and manufacturer.
- .3 Waste Management and Disposal: Separate waste materials for reuse and recycling in accordance with Section 01 74 19 - Construction/Demolition Waste Management and Disposal.

Part 2 Products

2.1 SHEET VAPOUR BARRIER

- .1 Polyethylene film: to CAN/CGSB-51.34.
- .2 6 mil thickness for all interior walls and ceilings.

2.2 SHEET VAPOUR BARRIER UNDER SLABS

- .1 Polyolefin Film: to ASTM E1745, meeting or exceeding Class A requirements underslab vapour retarder.
 - .1 Acceptable Material: STEGO wrap vapour barrier.

2.3 ACCESSORIES

- .1 Joint sealing tape: air resistant pressure sensitive adhesive tape, type recommended by vapour barrier manufacturer, 50 mm wide for lap joints and perimeter seals, 25 mm wide elsewhere.
- .2 Sealant: compatible with vapour retarder materials, recommended by vapour retarder manufacturer. To Section 07 92 00 - Joint Sealing.

Part 3

Execution

3.1

INSTALLATION

- .1 Ensure services are installed and inspected prior to installation of retarder.
- .2 Install sheet vapour retarder to form continuous retarder.
- .3 Use sheets of largest practical size to minimize joints.
- .4 Seal lap joints of sheet vapour barrier with sealing tape
- .5 Inspect for continuity. Repair punctures and tears with sealing tape before work is concealed.

3.2

EXTERIOR SURFACE OPENINGS

- .1 Cut sheet vapour retarder to form openings and ensure material is lapped and sealed to frame.

3.3

PERIMETER SEALS

- .1 Seal perimeter of sheet vapour barrier as follows:
 - .1 Apply continuous bead of sealant to substrate at perimeter of sheets.
 - .2 Lap sheet over sealant and press into sealant bead.
 - .3 Install staples through lapped sheets at sealant bead into wood substrate.
 - .4 Ensure that no gaps exist in sealant bead. Smooth out folds and ripples occurring in sheet over sealant.

3.4

LAP JOINT SEALS

- .1 Seal lap joints of sheet vapour barrier as follows:
 - .1 Attach first sheet to substrate.
 - .2 Apply continuous bead of sealant over solid backing at joint.
 - .3 Lap adjoining sheet minimum 150 mm and press into sealant bead.
 - .4 Install staples through lapped sheets at sealant bead into wood substrate.
 - .5 Ensure that no gaps exist in sealant bead. Smooth out folds and ripples occurring in sheet over sealant.

3.5

ELECTRICAL BOXES

- .1 Seal electrical switch and outlet device boxes that penetrate vapour barrier as follows:
 - .1 Install moulded box vapour barrier. Wrap boxes with film sheet providing minimum 300 mm perimeter lap flange.
 - .2 Apply sealant to seal edges of flange to main vapour barrier and seal wiring penetrations through box cover.

3.6

PROTECTION

- .1 Protect installed vapour barrier from damage of other trades

END OF SECTION

Part 1 General

1.1 REFERENCES

- .1 American Architectural Manufacturers Association
 - .1 AAMA 508-05: Voluntary Test Method and Specification for Pressure Equalized Rain Screen Wall Cladding Systems
- .2 American Society for Testing and Materials International, (ASTM)
 - .1 E 330 Structural Performance of Exterior Windows, Curtain Walls, and Doors Under the Influence of Wind Loads
 - .2 E 283 Rate of Leakage through Exterior Windows, Curtain Walls, and Doors

1.2 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Submit submittals in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Product Data: Submit manufacturer's printed product literature, specifications and datasheets.
- .3 Shop Drawings: Submit shop drawings showing project layout and elevations; fastening and anchoring methods; detail and location of joints, sealants, and gaskets, including joints necessary to accommodate thermal movement; trim; flashing; and accessories.
- .3 Samples: Submit duplicate samples of system, representative of materials, finishes and colours.
- .4 Manufacturer's Instructions: Submit manufacturer's installation instructions.

1.3 QUALITY ASSURANCE

- .1 Fabricator/installer as acceptable to the composite panel manufacturer.

1.4 WASTE MANAGEMENT AND DISPOSAL

- .1 Separate and recycle waste materials in accordance with Section 01 74 21 - Construction/Demolition Waste Management And Disposal.

Part 2 Products

2.1 COMPOSITE PANELS

- .1 Manufacturer Alucobond
- .2 Thickness: 3mm
- .3 Finish:
 - .1 Coil coated KYNAR[®] 500 or HYLAR[®] 5000 based Polyvinylidene Fluoride (PVDF) or Fluoro Ethylene – Alkyl Vinyl Ether (FEVE) resin in conformance with the following general requirements of AAMA 2605.
 - .2 Colour:
 - .1 Standard colour as selected by the Construction Manager from manufacturer's standard color palette.
 - .2 Coating Thickness: 1.0 mil (±0.2 mil).

2.2 PANEL FABRICATION

- .1 Composition
 - .1 Two sheets of aluminum sandwiching a solid core of extruded thermoplastic material formed in a continuous process with no glues or adhesives between dissimilar materials. The core material shall be free of voids and/or air spaces and not contain foamed insulation material. Products laminated sheet by sheet in a batch process using glues or adhesives between materials shall not be acceptable.

2.3 TOLERANCES

- .1 Panel Bow: Maximum 0.8% of any 1828mm (72") panel dimension.
- .2 Panel Dimensions: Field fabrication shall be allowed where necessary, but shall be kept to an absolute minimum. All fabrication shall be done under controlled shop conditions when possible.
- .3 Panel lines, breaks, and angles shall be sharp, true, and surfaces free from warp and buckle.
- .4 Maximum deviation from panel flatness shall be 1/8" in 5'0" on panel in any direction for assembled units. (Non-accumulative - No Oil Canning)

2.4 SYSTEM TYPE

- .1 Pressure Equalized Rain Screen System.

2.5 COMPONENTS

- .1 Composite panels shall be capable of withstanding building movements and weather exposures based on the following test standards required by the Architect and/or the local building code.
 - .1 Wind Load:
 - .1 Panels shall be designed to withstand the Design Wind Load based upon the local building code, but in no case less than 20 pounds per square foot (psf) and 30 psf on parapet and corner panels. Wind load testing shall be conducted in accordance with ASTM E330 to obtain the following results.
 - .2 Normal to the plane of the wall between supports, deflection of the secured perimeter-framing members shall not exceed L/175 or 3/4", whichever is less.
 - .3 Normal to the plane of the wall, the maximum panel deflection shall not exceed L/60 of the full span.
 - .4 Maximum anchor deflection shall not exceed 1/16".
 - .5 At 1-1/2 times design pressure, permanent deflections of framing members shall not exceed L/100 of span length and components shall not experience failure or gross permanent distortion. At connection points of framing members to anchors, permanent set shall not exceed 1/16".
 - .2 Air/Water System Test
 - .1 Air Infiltration - When tested in accordance with ASTM E283, air infiltration at 1.57 psf must not exceed 0.06 cfm/ft² of wall area.
 - .2 Water Infiltration - Water infiltration is defined as uncontrolled water leakage through the exterior face of the assembly. Systems not using a construction sealant at the panel joints (i.e. Rout and Return Dry and Rear Ventilated Systems) shall be designed to drain any water leakage occurring at the joints. No water infiltration shall occur in any system under a differential static pressure of 6.24 psf after 15 minutes of exposure in accordance with ASTM E331.
 - .3 Pressure Equalized Rain Screen Systems shall comply with AAMA 508-05 Voluntary Test Method and Specification for Pressure Equalized Rain Screen Wall Cladding Systems

2.6 ACCESSORIES

- .1 Extrusions, formed members, sheet, and plate shall conform with ASTM B209 and the recommendations of the manufacturer.
- .2 Panel stiffeners, if required, shall be structurally fastened or restrained at the ends and shall be secured to the rear face of the composite panel with silicone of sufficient size and

- strength to maintain panel flatness. Stiffener material and/or finish shall be compatible with the silicone.
- .3 Sealants and gaskets within the panel system shall be as per manufacturer's standards to meet performance requirements.
 - .4 Fabricate flashing materials from 0.030" minimum thickness aluminum sheet painted to match the adjacent curtain wall / panel system where exposed. Provide a lap strap under the flashing at abutted conditions and seal lapped surfaces with a full bed of non-hardening sealant.
 - .5 Fasteners (concealed/exposed/non-corrosive): Fasteners as recommended by panel manufacturer. Do not expose fasteners except where unavoidable and then match finish of adjoining metal.

Part 3 Execution

3.1 MANUFACTURER'S INSTRUCTIONS

- .1 Compliance: Comply with manufacturer's written data, including product technical bulletins, product catalogue installation instructions, product carton installation instructions, and data sheets.

3.2 INSPECTION

- .1 Surfaces to receive panels shall be even, smooth, sound, clean, dry and free from defects detrimental to work. Notify Construction Manager in writing of conditions detrimental to proper and timely completion of the work. Do not proceed with erection until unsatisfactory conditions have been corrected.
- .2 Surfaces to receive panels shall be structurally sound as determined.

3.3 INSTALLATION

- .1 Erect panels plumb, level, and true.
- .2 Attachment system shall allow for the free and noiseless vertical and horizontal thermal movement due to expansion and contraction for a material temperature range of -20°F to +180°F. Buckling of panels, opening of joints, undue stress on fasteners, failure of sealants or any other detrimental effects due to thermal movement will not be permitted. Fabrication, assembly, and erection procedure shall account for the ambient temperature at the time of the respective operation.
- .3 Panels shall be erected in accordance with an approved set of shop drawings.
- .4 Anchor panels securely per engineering recommendations and in accordance with approved shop drawings to allow for necessary thermal movement and structural support.
- .5 Conform to panel fabricator's instructions for installation of concealed fasteners.
- .6 Do not install component parts that are observed to be defective, including warped, bowed, dented, abraded, and broken members.
- .7 Do not cut, trim, weld, or braze component parts during erection in a manner which would damage the finish, decrease strength, or result in visual imperfection or a failure in performance. Return component parts which require alteration to shop for refabrication, if possible, or for replacement with new parts.
- .8 Separate dissimilar metals and use gasketed fasteners where needed to eliminate the possibility of corrosive or electrolytic action between metals.

3.4 ADJUSTING AND CLEANING

- .1 Remove and replace panels damaged beyond repair as a direct result of the panel installation. After installation, panel repair and replacement shall become the responsibility of the General Contractor.
- .2 Repair panels with minor damage.
- .3 Remove masking as soon as possible after installation.
- .4 Make sure weep holes and drainage channels are unobstructed and free of dirt and sealants.

99% REVIEW

- .5 Perform cleaning after installation to remove construction and accumulated environmental dirt.
- .6 Upon completion of installation, remove surplus materials, rubbish, tools and equipment barriers.

END OF SECTION

Part 1 General

1.1 REFERENCES

- .1 ASTM International Inc.
 - .1 ASTM D1863-05 (2011)e1, Standard Specification for Mineral Aggregate Used on Built-up Roofs.
 - .2 ASTM D4637/D4637M-12, Standard Specification for EPDM Sheet Used In Single-Ply Roof Membrane.
- .2 Canada Green Building Council (CaGBC)
 - .1 LEED Canada-NC Version 1.0-2004, LEED (Leadership in Energy and Environmental Design): Green Building Rating System Reference Package For New Construction and Major Renovations (including Addendum 2007).
 - .2 LEED Canada-CI Version 1.0 2007, LEED (Leadership in Energy and Environmental Design): Green Building Rating System Reference Guide For Commercial Interiors
- .3 Canadian General Standards Board (CGSB)
 - .1 CAN/CGSB-51.34-M86(R1988), Vapour Barrier, Polyethylene Sheet for Use in Building Construction.
- .4 Canadian Roofing Contractors' Association (CRCA)
 - .1 CRCA Roofing Specification Manual 2011.
- .5 Canadian Standards Association (CSA International)
 - .1 CSA A123.21-10, Standard Test Method for the Dynamic Wind Uplift Resistance of Mechanically Attached Membrane-Roofing Systems
- .6 Health Canada/Workplace Hazardous Materials Information System (WHMIS)
 - .1 Material Safety Data Sheets (MSDS).
- .7 Underwriters' Laboratories of Canada (ULC)
 - .1 CAN/ULC-S701-11, Standard for Thermal Insulation, Polystyrene, Boards and Pipe Covering.

1.2 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Provide submittals in accordance with Section 01 33 00.
- .2 Product Data:
 - .1 Provide manufacturer's printed product literature, specifications and datasheets for membranes, insulation and include product characteristics, performance criteria, physical size, finish and limitations.
 - .2 Provide two copies of WHMIS MSDS.
- .3 Shop drawings:
 - .1 Provide drawings stamped and signed by professional engineer registered or licensed in Province of Manitoba, Canada.
 - .2 Indicate flashing, control joints, tapered insulation, penetrations, field fabricated seams and details.
 - .3 Provide layout for tapered insulation.
- .4 Test and Evaluation Reports: submit laboratory test reports certifying compliance of roofing membrane with specification requirements.
 - .1 Compatibility of materials: submit written declaration to Engineer as described in PART 2, PERFORMANCE CRITERIA.
- .5 Manufacturer's Installation Instructions: indicate special precautions required for seaming the membrane.
- .6 Sustainable Design Submittals: LEED Submittals: in accordance with Section 01 47 15 - LEED Requirements.

1.3 QUALITY ASSURANCE

- .1 Installer qualifications: company or person specializing in application of EPDM roofing systems with 5 years documented experience and approved by manufacturer.

-
- 1.4 DELIVERY, STORAGE AND HANDLING**
- .1 Deliver, store and handle materials in accordance with manufacturer's written instructions and Section 01 60 00.
 - .2 Storage and Handling Requirements:
 - .1 Provide and maintain dry, off-ground weatherproof storage.
 - .2 Store materials on supports to prevent deformation.
 - .3 Remove only in quantities required for same day use.
 - .4 Store uncured flashing and jointing materials to prevent premature curing and freezing.
 - .5 Store insulation protected from sunlight and weather and deleterious materials.
 - .6 Store roofing materials in accordance with manufacturer's written instructions, to prevent damage or loss of performance.
 - .3 Packaging Waste Management: remove for reuse and return by manufacturer of pallets, crates, padding, and packaging materials as specified in Construction Waste Management Plan, Waste Reduction Workplan in accordance with Section 01 74 19 - Construction/Demolition Waste Management and Disposal and Section 01 47 15.
- 1.5 FIELD CONDITIONS**
- .1 Ambient Conditions:
 - .1 Apply EPDM membrane only when surfaces and ambient temperatures are within manufacturers' prescribed limits.
 - .2 Do not install EPDM membrane when air and substrate temperature remains below 5 degrees C in accordance with manufacturer's recommendations or when wind chill gives equivalent cooling effect.
 - .3 Install EPDM membrane on dry substrate, free of snow and ice. Use only dry materials and apply only during weather that will not introduce moisture into system.
- 1.6 WARRANTY**
- .1 For the Work of this Section 07 53 23 - Ethylene-Propylene-Diene-Monomer Roofing, 12 months warranty period is extended to 20 year membrane.
- Part 2 Products**
- 2.1 ROOF SYSTEM**
- .1 EPDM elastomeric membrane roofing consisting of: non-reinforced membrane for use loose laid and ballasted system.
- 2.2 PERFORMANCE CRITERIA**
- .1 Compatibility between components of system and adjacent materials is essential.
 - .1 Provide a written declaration to Construction Manager stating that all materials and components, as assembled in system, meet this requirement.
 - .2 Roofing system: to CSA A123.21 for wind uplift resistance.
- 2.3 VAPOUR RETARDER**
- .1 6 mil Poly Vapour.
- 2.4 POLYSTYRENE INSULATION**
- .1 Expanded polystyrene insulation: to CAN/ULC-S701, Type 1, R Value as indicated, square edges.

2.5 MEMBRANE

- .1 Ethylene propylene diene monomer (EPDM sheet membrane): to ASTM D4637.
 - .1 Type 1, Class A 0.045 inch (1.14 mm) EPDM thick, non-reinforced membrane for use in loose laid and ballasted system.
 - .2 Self-curing, EPDM based membrane for use as flashing as required by membrane manufacturer.

2.6 SEALERS

- .1 Sealants: asbestos-free sealant, compatible with systems materials, recommended by system manufacturer and. in accordance with Section 07 92 00 - Joint Sealants.

2.7 BALLAST

- .1 Stone: 19 to 32 mm size, well graded crushed stone, opaque, non-porous, washed, free from fines, long splinters, ice and snow.
- .2 Gravel: to ASTM D1863, crushed stone.

2.8 FASTENING

- .1 Bar, with prepunched holes and screws.
- .2 Screws and washers as recommended by manufacturer.

2.9 ADHESIVES, TAPES AND PRIMERS

- .1 Adhesive, tapes and primers, in accordance with manufacturer's recommendations.

2.10 SOURCE QUALITY CONTROL

- .1 Provide laboratory test reports certifying compliance of roofing materials with specification requirements as described in PART 1, ACTION AND INFORMATION SUBMITTALS.

Part 3 Execution

3.1 QUALITY OF WORK

- .1 Compliance: comply with manufacturer's written recommendations, including product technical bulletins, handling, storage and installation instructions, and datasheets.
- .2 Do examination, preparation and roofing Work in accordance with Roofing Manufacturer's Specification Manual and CRCA Roofing Specification Manual, Provincial Roofing Association Manual, except where specified otherwise.

3.2 SUBSTRATE EXAMINATION

- .1 Verification of Conditions: examine substrates and immediately inform Construction Manager in writing of defects.
- .2 Evaluation and Assessment: prior to beginning work ensure:
 - .1 Substrates are firm, straight, smooth, dry, free of snow, ice or frost, and swept clean of dust and debris.
 - .2 Curbs have been built.
 - .3 Drains have been installed at proper elevations relative to finished surfaces.
 - .4 Plywood and lumber nailer plates have been installed to walls and parapets as indicated.

3.3 PROTECTION OF IN-PLACE CONDITIONS

- .1 Cover walls, walks and adjacent work where materials hoisted or used.
- .2 Use warning signs and barriers: Maintain in good order until completion of Work.
- .3 Dispose of rain water away from face of building until drains or hoppers installed and connected.

- .4 Protect from traffic and damage: Comply with precautions deemed necessary by Construction Manager.
- .5 Place plywood runways over work to enable movement of material and other traffic.
- .6 At end of each day's work or when stoppage occurs due to inclement weather, provide protection for completed Work and materials out of storage.
- .7 Seal and ballast exposed edges.
- .8 If metal connectors used, treat connectors and decking with rust proofing or galvanization.

3.4 VAPOUR RETARDER

- .1 Apply 6 mil poly vapour barrier.

3.5 INSULATION: LOOSE LAID APPLICATION

- .1 Place boards in parallel rows with ends staggered, and in firm contact with one another.
- .2 Cut end pieces to suit.

3.6 (EXPOSED) CONVENTIONAL MEMBRANE ROOFING (CMR) APPLICATION

- .1 Membrane, loose laid, ballasted application:
 - .1 Position membrane over insulation starting at highest point.
 - .2 Allow membrane to relax for a minimum of 30 minutes.
 - .3 Ballast membrane with gravel after completion of seams and sealing penetrations.
- .2 Lap joints:
 - .1 Clean both mating surfaces, apply primer and splicing contact cement in accordance with manufacturer's written instructions.
 - .2 Apply double-sided adhesive tape in accordance with manufacturer's written instructions.
 - .3 Solvent clean edge and apply lap sealant.
 - .4 Perimeter securement with adhesive, mechanical fastened in accordance with manufacturer's written instructions.
- .3 Edge securement:
 - .1 Attach fastening strips to mechanically secure membrane. Ensure screws penetrate into deck or wood nailers.
 - .2 Adhesive recommended by manufacturer.
- .4 Flashings:
 - .1 Install cured or uncured EPDM membrane flashings in accordance with manufacturer's written instructions.
- .5 Penetrations:
 - .1 Install drain pans, vent stack covers and other penetration flashings and seal to membrane in accordance with manufacturer's recommendations and details.

3.7 BALLAST AND PROTECTIVE COVERING

- .1 Apply stone ballast, as soon as possible after placement of membrane, at minimum rate of 75 kg/m².
- .2 Spread stone ballast to an even thickness over entire area.
- .3 Spread additional stone ballast around perimeter for width of 1200 mm to increase ballast weight to 25.3 kg/m². (17 lb/sq ft).

3.8 FIELD QUALITY CONTROL

- .1 Inspection: Inspection and testing of EPDM membrane application will be carried out by testing laboratory designated by Construction Manager.

3.9

CLEANING

- .1 Clean to Construction Manager's approval, soiled surfaces, spatters, and damage caused by Work of this Section.
- .2 Check drains to ensure cleanliness and proper function, and remove debris, equipment and excess material from site. Waste Management: separate waste materials for reuse and recycling in accordance with Section 01 74 19 - Construction/Demolition Waste Management and Disposal, 01 47 15 - LEED Requirements.

END OF SECTION

Part 1 General

1.1 REFERENCES

- .1 American Society for Testing and Materials International, (ASTM).
 - .1 ASTM C1177/C1177M-08, Standard Specification for Glass Mat Gypsum Substrate for Use as Sheathing.
 - .2 ASTM D 6878/D6878M-11a - Standard Specification for Thermoplastic Polyolefin Based Sheet Roofing.
- .2 Canadian Roofing Contractors' Association (CRCA).
 - .1 CRCA Roofing Specification Manual 2011.
- .3 Canada Green Building Council (CaGBC).
 - .1 LEED Canada-NC Version 1.0-2004, LEED (Leadership in Energy and Environmental Design): Green Building Rating System Reference Package For New Construction and Major Renovations (including Addendum [2007]).
 - .2 LEED Canada-CI Version 1.0-2007, LEED (Leadership in Energy and Environmental Design): Green Building Rating System Reference Guide For Commercial Interiors
- .4 Factory Mutual (FM Global).
 - .1 FM Approval Standard # 4470-86, Class 1 Roof Covers.
- .5 Health Canada/Workplace Hazardous Materials Information System (WHMIS).
 - .1 Material Safety Data Sheets (MSDS).
- .6 Underwriters' Laboratories of Canada (ULC).
 - .1 CAN/ULC-S704-11, Thermal Insulation, Polyurethane and Polyisocyanurate Boards, Faced.

1.2 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Submit submittals in accordance with Section 01 33 00.
- .2 Manufacturer's Instructions: Provide to indicate special handling criteria, installation sequence, cleaning procedures.
- .3 Submit product data sheets for roofing membrane, insulation, plates, fasteners, adhesive, sealant coated metal, flashing and applicable roof top accessories.
- .4 Shop drawings: Indicate sloped insulation, flashing, control joints, insulation penetrations field fabricated seams details.
- .5 Installer Qualifications: Letter from manufacturer attesting that the roofing installer meets the specified qualifications.
- .6 Pre-Installation Notice: Copy to show that manufacturer's required Pre Installation Notice (PIN) has been accepted and approved by the manufacturer.
- .7 Submit 20 year warranty covering membrane only.
- .8 Sustainable Design Submittals: LEED Submittals: in accordance with Section 01 47 15 - LEED Requirements.

1.3 DELIVERY, STORAGE AND HANDLING

- .1 Deliver, handle, store and protect materials in accordance with Section 01 61 00 - Common Product Requirements.
- .2 Provide and maintain dry, off-ground weatherproof storage.
- .3 Store materials on supports to prevent deformation.
- .4 Remove only in quantities required for same day use.
- .5 Store uncured flashing and jointing materials to prevent premature curing and freezing.
- .6 Store insulation protected from sunlight and weather and deleterious materials.
- .7 Store roofing materials in accordance with manufacturer's written instructions, to prevent damage or loss of performance.

1.4 PROJECT/SITE ENVIRONMENT REQUIREMENTS

- .1 Temperature, relative humidity, moisture content.

- .1 Apply TPO membrane only when surfaces and ambient temperatures are within manufacturers' prescribed limits.
- .2 Do not install TPO membrane when air and substrate temperature remains below 5 degrees C in accordance with manufacturer's recommendations or when wind chill gives equivalent cooling effect.
- .3 Install TPO membrane on dry substrate, free of snow and ice. Use only dry materials and apply only during weather that will not introduce moisture into system.

Part 2 Products

2.1 COMPATIBILITY

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

2.2 POLYSTYRENE INSULATION

- .1 Expanded polystyrene insulation: to CAN/ULC-S701, Type 1, R Value as indicated, square edges.

2.3 MEMBRANE

- .1 Flexible, heat weldable sheet composed of thermoplastic polyolefin polymer; complying with ASTM D 6878, with polyester weft inserted reinforcement and the following additional characteristics:
 - .1 Thickness: 0.045 inch (1.14 mm) plus/minus 10 percent, with coating thickness over reinforcement of 0.024 inch (0.61 mm) plus/minus 10 percent.
 - .2 Sheet Width: Provide the widest available sheets to minimize field seaming.
- .2 Color: White.
- .3 Roof Walkway Pads: N/A.

2.4 SEALERS

- .1 Sealants: Caulking see Section 07 92 00 - Joint Sealants.

2.5 FASTENERS FLASHINGS ADHESIVES, TAPES AND PRIMERS

- .1 Type and size as required by roof membrane manufacturer for roofing system and warranty to be provided; use only fasteners furnished by roof membrane manufacturer.
- .2 Curb and Parapet Flashing: Same material as membrane, with encapsulated edge which eliminates need for seam sealing the flashing-to-roof splice; 18 inches (457 mm).
- .3 Formable Flashing: Non-reinforced, flexible, heat weldable sheet, composed of thermoplastic polyolefin polymer and ethylene propylene rubber.
 - .1 Thickness: 0.060 inch (1.52 mm) plus/minus 10 percent.
- .4 Adhesive, tapes and primers, in accordance with manufacturer's recommendations.
- .5 Parapet Copings: Formed metal coping with galvanized steel anchor/support cleats for capping any parapet wall; watertight, maintenance free, without exposed fasteners; butt type joints with concealed splice plates; mechanically fastened as indicated per manufacturer's specifications.
 - .1 Material and Finish: 24 gage, 0.024 inch (0.06 mm) thick galvanized steel with Kynar 500 finish in manufacturer's standard color; matching concealed joint splice plates; factory-installed protective plastic film.
 - .2 Fasteners: Minimum pull out resistance of 240 pounds (109 kg) for actual substrate used; no exposed fasteners.
- .6 Wood Nailers: Construction grade, S4S, meeting the requirements of CSA 0141
 - .1 Width: 3-1/2 inches (90 mm), nominal minimum, or as wide as the nailing flange of the roof accessory to be attached to it.

- .2 Thickness: Same as thickness of roof insulation.

Part 3 Execution

3.1 WORKMANSHIP

- .1 Do roofing work in accordance with applicable, standard in CRCA Roofing Specifications Manual, except where specified otherwise.
- .2 Do work in accordance with TPO membrane manufacturer's printed application instructions except where specified otherwise.

3.2 SUBSTRATE EXAMINATION

- .1 Examine substrates and immediately inform Construction Manager in writing of defects.
- .2 Prior to beginning Work ensure:
 - .1 Substrates are firm, straight, smooth, dry, free of snow, ice or frost, and swept clean of dust and debris.
 - .2 Curbs have been built.
 - .3 Drains have been installed at proper elevations relative to finished surfaces.
 - .4 Plywood and lumber nailer plates have been installed to walls and parapets as indicated.

3.3 PROTECTION

- .1 Cover walls, walks and adjacent work where materials hoisted or used.
- .2 Use warning signs and barriers. Maintain in good order until completion of Work.
- .3 Dispose of rain water away from face of building until drains or hoppers installed and connected.
- .4 Protect from traffic and damage. Comply with precautions deemed necessary by Consultant.
- .5 Place plywood runways over work to enable movement of material and other traffic.
- .6 At end of each day's work or when stoppage occurs due to inclement weather, provide protection for completed Work and materials out of storage.
- .7 Seal and ballast exposed edges.
- .8 If metal connectors used, treat connectors and decking with rust proofing or galvanization.

3.4 EXPOSED MEMBRANE APPLICATION

- .1 Insulation: mechanically fastened application.
 - .1 Mechanically fasten insulation using screws and pressure distribution plates
 - .2 Number and pattern of screws per board to meet Factory Mutual requirements for I-90 and manufacturer's recommendations.
 - .3 Place boards in parallel rows with ends staggered, and in firm contact with one another.
 - .4 Cut end boards to suit.
- .2 Membrane, mechanically fastened application
 - .1 Install to manufacturer's written instructions.
 - .2 Apply fasteners to membrane and substrate in accordance with manufacturer's written instructions.
- .3 Lap joints
 - .1 Clean both mating surfaces, apply in accordance with manufacturer's written instructions.
 - .2 Perimeter securement mechanically fastened in accordance with manufacturer's written instructions.
- .4 Edge securement
 - .1 Attach fastening strips to mechanically secure membrane in accordance with manufacturer's written instructions.
- .5 Flashings
 - .1 Install TPO membrane flashings in accordance with manufacturer's written instructions.

- .6 Penetrations
 - .1 Install drain pans, vent stack covers and other penetration flashings and seal to membrane in accordance with manufacturer's recommendations and details.
- .9 Walkways: install walkways as indicated.

3.5 **FIELD QUALITY CONTROL**

- .1 Inspections of TPO roof system application will be carried out by roofing systems manufacturer's representative.

3.6 **CLEANING**

- .1 Clean to Construction Manager's approval, soiled surfaces, spatters, and damage caused by Work of this Section.
- .2 Check drains to ensure cleanliness and proper function, and remove debris, equipment and excess material from site. Waste Management: separate waste materials for reuse and recycling in accordance with Section 01 74 19 - Construction/Demolition Waste Management and Disposal, 01 47 15 - LEED Requirements.

END OF SECTION

Part 1 General

1.1 REFERENCES

- .1 The Aluminum Association Inc. (AA)
 - .1 Aluminum Sheet Metal Work in Building Construction-2002.
 - .2 AA DAF45-03(R009), Designation System for Aluminum Finishes.
- .2 American Society for Testing and Materials (ASTM International)
 - .1 ASTM A591/A591M-98, Standard Specification for Steel Sheet, Electrolytic Zinc-Coated, for Light Coating Mass Applications.
 - .2 ASTM A606-04, Standard Specification for Steel, Sheet and Strip, High-Strength, Low-Alloy, Hot-Rolled and Cold-Rolled, with Improved Atmospheric Corrosion Resistance.
 - .3 ASTM A653/A653M-11, Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.
 - .4 ASTM A792/A792M-10, Standard Specification for Steel Sheet, 55% Aluminum-Zinc Alloy-Coated by the Hot-Dip Process.
 - .5 ASTM B32-08, Standard Specification for Solder Metal.
 - .6 ASTM D523-08, Standard Test Method for Specular Gloss.
- .3 Canadian Roofing Contractors Association (CRCA)
 - .1 Roofing Specifications Manual 2011.
- .4 Canadian General Standards Board (CGSB)
 - .1 CAN/CGSB-37.5-M89, Cutback Asphalt Plastic Cement.
 - .2 CAN/CGSB-51.32-M77, Sheathing, Membrane, Breather Type.
 - .3 CAN/CGSB-93.1-M85, Sheet Aluminum Alloy, Prefinished, Residential.
- .5 Canadian Standards Association (CSA International)
 - .1 CSA A123.3-05(R2010), Asphalt Saturated Organic Roofing Felt.
 - .2 CSA-A440-00/A440.1-00 - A440-00, Windows / Special Publication A440.1-00, User Selection Guide to CSA Standard A440-00,(R2005) Windows.
 - .3 CSA B111-1974(R2003), Wire Nails, Spikes and Staples.

1.2 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Submit shop drawings.
- .2 Submit duplicate 50 x 50 mm samples of each type of sheet metal material, colour and finish.

Part 2 Products

2.1 SHEET METAL MATERIALS

- .1 Zinc coated steel sheet: 0.45 mm thickness, commercial quality to ASTM A653/A653M.
- .2 Aluminum-zinc alloy coated steel sheet: to ASTM A792/A792M, commercial quality, grade with AZ180 coating, regular spangle surface, chemically treated for unpainted finish and not chemically treated for paint finish, 0.45 mm base metal thickness.

2.2 PREFINISHED ALUMINUM SHEET

- .1 Finish: factory applied coating to match metal wall / roof cladding as indicated.
- .2 Thickness specified for prefinished aluminum sheet applies to base metal.

2.3 ACCESSORIES

- .1 Isolation coating: alkali resistant bituminous paint.
- .2 Plastic cement: to CAN/CGSB 37.5.
- .3 Underlay for metal flashing: dry sheathing to CAN/CGSB-51.32, asphalt laminated 3.6 to 4.5 kg Kraft paper, No. 15 perforated asphalt felt to CSA A123.3.
- .4 Sealants: to Section 07 92 00.
- .5 Cleats: of same material, and temper as sheet metal, minimum 50 mm wide. Thickness 0.45 mm same as sheet metal being secured.

- .6 Fasteners: of same material as sheet metal, to CSA B111, of length and thickness suitable for metal flashing application.
- .7 Washers: of same material as sheet metal, 1 mm thick with rubber packing.
- .8 Solder: to ASTM B32, alloy composition Sn.
- .9 Flux: rosin, cut hydrochloric acid, or commercial preparation suitable for materials to be soldered.
- .10 Touch-up paint: as recommended by prefinished material manufacturer.

2.4 FABRICATION

- .1 Fabricate metal flashings and other sheet metal work in accordance with applicable CRCA 'FL' series details and as indicated.
- .2 Fabricate aluminum flashings and other sheet aluminum work in accordance with AA-Aluminum Sheet Metal Work in Building Construction.
- .3 Form pieces in 2400 mm maximum lengths. Make allowance for expansion at joints.
- .4 Hem exposed edges on underside 12 mm. Mitre and seal corners with sealant.
- .5 Form sections square, true and accurate to size, free from distortion and other defects detrimental to appearance or performance.
- .6 Apply isolation coating to metal surfaces to be embedded in concrete or mortar.

2.5 METAL FLASHINGS

- .1 Form flashings, copings and fascias to profiles indicated of 0.45mm thick galvanized, prefinished steel sheet and aluminum sheet.

2.6 REGLETS AND CAP FLASHINGS

- .1 Form reglets metal cap flashing of 0.45 mm thick sheet metal for base flashings as detailed and in accordance with CRCA details. Provide slotted fixing holes and steel/plastic washer fasteners. Cover face and ends with plastic tape.

2.7 DOWNPIPES AND HOPPERS

- .1 Form hoppers and downpipes from 0.45 mm thick prefinished steel sheet metal.
- .2 Sizes and profiles as indicated.

2.8 SCUPPERS

- .1 Form scuppers from 0.762 mm thick pre-finished steel sheet metal.
- .2 Colour as selected by Construction Manager.
- .3 Sizes and profiles as indicated.

2.9 ALUMINUM FINISHES

- .1 Finish exposed surfaces of aluminium components in accordance with AA DAF45.
- .2 Appearance and properties of anodized finishes designated by the Aluminum Association as Architectural Class 1, Architectural Class 2, and Protective and Decorative shall meet requirements of CAN/CSA-A440/A440.1, for coating Classes 1, 2 and 3 respectively.

Part 3 Execution

3.1 INSTALLATION

- .1 Install sheet metal work in accordance with CRCA details, Aluminium Sheet Metal Work in Building Construction, as detailed.
- .2 Use concealed fastenings except where approved before installation.
- .3 Provide underlay under sheet metal. Secure in place and lap joints 100 mm.
- .4 Counterflash bituminous flashings at intersections of roof with vertical surfaces and curbs. Flash joints using S-lock, standing seams forming tight fit over hook strips, as detailed.
- .5 Lock end joints and caulk with sealant.
- .6 Install surface mounted reglets true and level, and caulk top of reglet with sealant.
- .7 Insert metal flashing into reglets, under cap flashing to form weather tight junction.

- .8 Turn top edge of flashing into recessed reglet or mortar joint minimum of 25 mm. Lead wedge flashing securely into joint.
- .9 Caulk flashing at reglet, cap flashing with sealant.

3.2 HOPPER AND DOWNPIPES

- .1 Install hoppers and downpipes and provide goosenecks back to wall. Secure downpipes to wall with straps at 1800 mm on centre; minimum two straps per downpipe. Solder seal joints.

3.3 SCUPPERS

- .1 Install scuppers and secure to building as indicated. Seal joints watertight.

END OF SECTION

Part 1 General

1.1 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Submit submittals in accordance with Section 01 33 00.
- .2 Product Data: Submit manufacturer's printed product literature, specifications and data sheet
- .3 Shop drawings: Indicate size and description of components, materials, attachment devices, description of frame and finish, and construction details.
- .4 Closeout Submittals: Provide maintenance data for hardware complete with pertinent details, spare parts lists and warnings against harmful maintenance materials and practices for incorporation into manual specified in 01 78 00 - Closeout Submittals.

Part 2 Products

2.1 MATERIALS

- .1 Metal roof hatch: 914 mm x 914 mm size and as indicated, single leaf, pre-assembled from the manufacturer.
- .2 Acceptable manufacturer: Bilco Type E with post.
- .3 Performance characteristics:
 - .1 Cover shall be reinforced to support a minimum live load of 40 psf (195kg/m²) with a maximum deflection of 1/150th of the span or 20 psf wind uplift.
 - .2 Operation of the cover shall be smooth and easy with controlled operation throughout the entire arc of opening and closing.
 - .3 Operation of the cover shall not be affected by temperature.
 - .4 Entire hatch shall be weathertight with fully welded corner joints on cover and curb.
- .4 Cover: 11 gauge aluminum with a 3" (76mm) beaded flange with formed reinforcing members. Cover shall have a heavy extruded EPDM rubber gasket that is bonded to the cover interior to assure a continuous seal when compressed to the top surface of the curb.
- .5 Cover insulation: Shall be fibreglass of 1" (25.4mm) thickness, fully covered and protected by a metal liner 18 gauge aluminum.
- .6 Curb: Shall be 12" (305mm) in height and of 11 gauge aluminum. The curb shall be formed with a 3-1/2" (89mm) flange with 7/16" (11.1mm) holes provided for securing to the roof deck. The curb shall be equipped with an integral metal cap flashing of the same gauge and material as the curb, fully welded at the corners, and flashed, including stamped tabs, 6" (153mm) on center, to be bent inward to hold roofing membrane securely in place.
- .7 Curb insulation: Shall be rigid, high-density fiberboard of 1" (25.4mm) thickness on outside of curb.
- .8 Lifting mechanisms: Manufacturer shall provide compression spring operators enclosed in telescopic tubes to provide, smooth, easy, and controlled cover operation throughout the entire arc of opening and closing. The upper tube shall be the outer tube to prevent accumulation of moisture, grit, and debris inside the lower tube assembly. The lower tube shall interlock with a flanged support shoe for aluminum construction: welded to the curb assembly.
- .9 Hardware:
 - .1 Heavy pintle hinges shall be provided.
 - .2 Cover shall be equipped with a spring latch with interior and exterior turn handles.
 - .3 Roof hatch shall be equipped with interior and exterior padlock hasps.
 - .4 The latch strike shall be a stamped component bolted to the curb assembly.
 - .5 Cover shall automatically lock in the open position with a rigid hold open arm equipped with a 1" (25.4mm) diameter red vinyl grip handle to permit easy release for closing.
 - .6 Compression spring tubes shall be an anti-corrosive composite material and all other hardware shall be zinc plated and chromate sealed. Springs shall have an electrocoated acrylic finish for corrosion resistance.

- .7 Cover hardware shall be bolted into heavy gauge channel reinforcing welded to the underside of the cover and concealed within the insulation space.
- .10 Finishes: Factory finish shall be mill finish aluminum.
- .11 Mechanical fasteners galvanized steel or aluminum consistent with the roof requirements.
- .12 Isolation coating: alkali resistant bituminous paint or epoxy solution.
- .13 Ladder safety post: pre assembled from the manufacturer.
 - .1 Tubular baked enamel steel post to lock when fully extended.
 - .2 Post to have controlled upward and downward movement.
 - .3 Release lever to disengage the post to allow it to be returned to its lowered position.
 - .4 Post to have adjustable mounting brackets to fit ladder rung spacing and clamp brackets to accommodate ladder rungs.
 - .5 Provide pull up loop at the upper end of the post to facilitate the post.
 - .6 Balancing spring: stainless steel to provide easy controlled operation when raising or lowering the post.
 - .7 Hardware: all mounting hardware stainless steel.

2.2 FABRICATION

- .1 Fabricate components free of twists, bends, or visual distortion and insulated. Weld corners and joints.
- .2 Assemble roof hatch components as indicated.
- .3 Ensure continuity of weather-tight seal.
- .4 Design flashings, extrusions to collect and lead off accumulated condensation.
- .5 Zinc plate hardware and attachments and shop prime ready for field painting.

Part 3 Execution

3.1 INSTALLATION

- .1 Erect components plumb, level and in proper alignment.
- .2 Ensure continuity of building envelope air barrier and vapour retarder systems.
- .3 Adjust and seal assembly with provision for expansion and contraction of components.
- .4 Secure curb assembly to structure.
- .5 Coat aluminum in contact with dissimilar materials, with isolation coating.
- .6 Secure and seal frame to curb.
- .7 Install safety post to ladder to manufacturer's installation instructions.

END OF SECTION

Part 1 General

1.1 REFERENCES

- .1 Health Canada/Workplace Hazardous Materials Information System (WHMIS)
 - .1 Material Safety Data Sheets (MSDS).
- .2 South Coast Air Quality Management District (SCAQMD), California State, Regulation XI. Source Specific Standards
 - .1 SCAQMD Rule 1168-A2005, Adhesive and Sealant Applications.
- .3 Underwriter's Laboratories of Canada (ULC)
 - .1 ULC-S115-11, Fire Tests of Fire stop Systems.
- .4 National Building Code of Canada(NBCC) 2010.

1.2 DEFINITIONS

- .1 Fire Stop Material: device intended to close off opening or penetration during fire or materials that fill openings in wall or floor assembly where penetration is by cables, cable trays, conduits, ducts and pipes and poke-through termination devices, including electrical outlet boxes along with their means of support through wall or floor openings.
- .2 Single Component Fire Stop System: fire stop material that has Listed Systems Design and is used individually without use of high temperature insulation or other materials to create fire stop system.
- .3 Multiple Component Fire Stop System: exact group of fire stop materials that are identified within Listed Systems Design to create on site fire stop system.
- .4 Tightly Fitted; (ref: NBC Part 3.1.9.1.1 and 9.10.9.6.1): penetrating items that are cast in place in buildings of non-combustible construction or have "0" annular space in buildings of combustible construction.
 - .1 Words "tightly fitted" should ensure that integrity of fire separation is such that it prevents passage of smoke and hot gases to unexposed side of fire separation.

1.3 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Provide submittals in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Product Data:
 - .1 Submit manufacturer's printed product literature, specifications and datasheet and include product characteristics, performance criteria, physical size, finish and limitations.
 - .2 Submit two copies of WHMIS MSDS - Material Safety Data Sheets.
- .3 Shop Drawings:
 - .1 Submit complete shop drawings (using architectural floor plans); show locations of all firestop seals including Divisions 14, 21, 22, 23 and 26 seals. Indicate ULC system number as applicable. Show penetrations and provide an indexing (identification) system for required seals.
 - .2 Shop drawings to be submitted and reviewed prior to forming of concrete openings and placement of sleeves by Divisions 14,21, 22, 23 and 26.
 - .3 Submit firestop seal details and confirmation of ULC system listings. Show any variations, limitations or areas where listings are expected to be exceeded.
 - .4 Provide copies of reviewed shop drawings to Divisions 14, 21, 22, 23 and 26
- .4 Samples: Submit duplicate 300 x 300 mm samples showing actual fire stop material proposed for project.
- .5 LEED Submittals: provide LEED submittals in accordance with Section 01 47 15 - Sustainable Requirements: Construction.
 - .1 Submit product data for recycled content, regional materials, certified wood and low emitting materials.
 - .2 Submit MSDS sheets indicating the VOC content of interior site applied adhesives and sealants.
 - .3 Submit a LEED Material Submittal Form, to identify recycled content, regional content or VOC emission when required by Submittal Requirements.

- .6 Quality assurance submittals: submit following in accordance with Section 01 45 00 - Quality Control.
 - .1 Test reports: in accordance with CAN-ULC-S101 for fire endurance and CAN-ULC-S102 for surface burning characteristics.
 - .1 Submit certified test reports from approved independent testing laboratories, indicating compliance of applied fire stopping with specifications for specified performance characteristics and physical properties.
 - .2 Certificates: submit certificates signed by manufacturer certifying that materials comply with specified performance characteristics and physical properties.
 - .3 Manufacturer's Instructions: submit manufacturer's installation instructions and special handling criteria, installation sequence, cleaning procedures.
 - .4 Manufacturer's Field Reports: submit to manufacturer's written reports within 3 days of review, verifying compliance of Work, as described in PART 3 - FIELD QUALITY CONTROL.

1.4 QUALITY ASSURANCE

- .1 Installer Qualifications:
 - .1 All firestopping installation work for entire project shall be by a single contractor experienced in firestopping. Individual disciplines shall NOT fire stop their own work.
 - .2 Installer shall be a company specializing in fire stopping installations with minimum five years documented experience, approved by material manufacturer and be a member in good standing with the Firestop Contractor International Association (FCIA)
- .1 Pre-Installation Meetings: convene pre-installation meeting one week prior to beginning work of this Section, with contractor's representative and Construction Manager:
 - .1 Verify project requirements.
 - .2 Review installation and substrate conditions.
 - .3 Co-ordination with other building subtrades.
 - .4 Review manufacturer's installation instructions and warranty requirements.
- .2 Site Meetings: as part of Manufacturer's Services described in PART 3 - FIELD QUALITY CONTROL, schedule site visits, to review Work, at stages listed.
 - .1 After delivery and storage of products, and when preparatory Work is complete, but before installation begins.
 - .2 Twice during progress of Work at 25% and 60% complete.
 - .3 Upon completion of Work, after cleaning is carried out.

1.5 DELIVERY, STORAGE AND HANDLING

- .1 Packing, shipping, handling and unloading:
 - .1 Deliver, store and handle materials in accordance with Section 01 61 00 - Common Product Requirements.
 - .2 Deliver, store and handle materials in accordance with manufacturer's written instructions.
 - .3 Deliver materials to the site in undamaged condition and in original unopened containers, marked to indicate brand name, manufacturer, ULC markings.
- .2 Storage and Protection:
 - .1 Store materials indoors in dry location and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.
 - .2 Replace defective or damaged materials with new.
- .3 Waste Management and Disposal: Separate waste materials for reuse and recycling in accordance with Section 01 74 19 - Construction/Demolition Waste Management and Disposal.

Part 2 Products

2.1 LEAD REQUIREMENTS

- .1 Limits in accordance with Section 01 47 15:
 - .1 Recycled Content Credit MR-4.2.
 - .2 Regional materials Credit MR-5.2.
 - .3 Low-Emitting Materials: Adhesives and Sealants, Credit EQ-4.1, VOC content to SCAQMD Rule 1168

2.2 MATERIALS

- .1 All similar materials from one manufacturer.
- .2 Fire stopping and smoke seal systems: in accordance with CAN-ULC-S115.
 - .1 Asbestos-free materials and systems capable of maintaining effective barrier against flame, smoke and gases in compliance with requirements of CAN-ULC-S115 and not to exceed opening sizes for which they are intended.
- .3 Service penetration assemblies: systems tested to CAN-ULC-S115.
- .4 Service penetration fire stop components: certified by test laboratory to CAN-ULC-S115.
- .5 Fire-resistance rating of installed fire stopping assembly in accordance with NBC.
- .6 Fire stopping and smoke seals at openings intended for ease of re-entry such as cables: elastomeric seal.
- .7 Fire stopping and smoke seals at openings around penetrations for pipes, ductwork and other mechanical items requiring sound and vibration control: elastomeric seal.
- .8 Primers: to manufacturer's recommendation for specific material, substrate, and end use.
- .9 Water (if applicable): potable, clean and free from injurious amounts of deleterious substances.
- .10 Damming and backup materials, supports and anchoring devices: to manufacturer's recommendations, and in accordance with tested assembly being installed as acceptable to authorities having jurisdiction.
 - .1 Insulation: mineral fibre insulation to system application:
 - .1 Mineral wool fibre semi-rigid insulation, Type 1,
 - .2 Preformed mineral fibre batt insulation to CAN/ULC-S702 or ASTM C665.
- .11 Sealants for vertical joints: non-sagging.

Part 3 Execution

3.1 MANUFACTURER'S INSTRUCTIONS

- .1 Compliance: comply with manufacturer's written recommendations or specifications, including product technical bulletins, handling, storage and installation instructions, and datasheets.

3.2 PREPARATION

- .1 Examine sizes and conditions of voids to be filled to establish correct thicknesses and installation of materials.
 - .1 Ensure that substrates and surfaces are clean, dry and frost free.
- .2 Prepare surfaces in contact with fire stopping materials and smoke seals to manufacturer's instructions.
- .3 Maintain insulation around pipes and ducts penetrating fire separation without interruption to vapour barrier.
- .4 Mask where necessary to avoid spillage and over coating onto adjoining surfaces; remove stains on adjacent surfaces.

3.3 INSTALLATION

- .1 Install fire stopping and smoke seal material and components in accordance with manufacturer's certified tested system listing.
- .2 Seal holes or voids made by through penetrations, poke-through termination devices, and unpenetrated openings or joints to ensure continuity and integrity of fire separation are maintained.

- .3 Provide temporary forming as required and remove forming only after materials have gained sufficient strength and after initial curing.
- .4 Tool or trowel exposed surfaces to neat finish.
- .5 Remove excess compound promptly as work progresses and upon completion.

3.4 SEQUENCES OF OPERATION

- .1 Proceed with installation only when submittals have been reviewed by Departmental Representative.
- .2 Install floor fire stopping before interior partition erections.
- .3 Metal deck bonding: fire stopping to precede spray applied fireproofing to ensure required bonding.
- .4 Mechanical pipe insulation: in accordance with Division 23 requirements.
 - .1 Ensure pipe insulation installation precedes fire stopping.

3.5 FIELD QUALITY CONTROL

- .1 Inspections: notify Construction Manager when ready for inspection and prior to concealing or enclosing fire stopping materials and service penetration assemblies.
- .2 Manufacturer's Field Services:
 - .1 Obtain written report from manufacturer verifying compliance of Work, in handling, installing, applying, protecting and cleaning of product and submit Manufacturer's Field Reports as described in PART 1 - SUBMITTALS.
 - .2 Provide manufacturer's field services consisting of product use recommendations and periodic site visits for inspection of product installation in accordance with manufacturer's instructions.
 - .3 Schedule site visits, to review Work, as directed in PART 1 - QUALITY ASSURANCE.

3.6 CLEANING

- .1 Proceed in accordance with Section 01 74 11 - Cleaning.
- .2 On completion and verification of performance of installation, remove surplus materials, excess materials, rubbish, tools and equipment.
- .3 Remove temporary dams after initial set of fire stopping and smoke seal materials.

3.7 SCHEDULE

- .1 Fire stop and smoke seal at:
 - .1 Penetrations through fire-resistance rated masonry, concrete, and gypsum board partitions and walls.
 - .2 Edge of floor slabs at curtain wall and precast concrete panels.
 - .3 Top of fire-resistance rated masonry and gypsum board partitions.
 - .4 Intersection of fire-resistance rated masonry and gypsum board partitions.
 - .5 Control and sway joints in fire-resistance rated masonry and gypsum board partitions and walls.
 - .6 Penetrations through fire-resistance rated floor slabs, ceilings and roofs.
 - .7 Openings and sleeves installed for future use through fire separations.
 - .8 Around mechanical and electrical assemblies penetrating fire separations.
 - .9 Rigid ducts: greater than 129 cm²: fire stopping to consist of bead of fire stopping material between retaining angle and fire separation and between retaining angle and duct, on each side of fire separation.

END OF SECTION

Part 1 General

1.1 SECTION INCLUDES

- .1 Materials, preparation and application for caulking and sealants.
- .2 Text to complete other various Sections containing sealant or caulking specifications.

1.2 REFERENCES

- .1 American Society for Testing and Materials International, (ASTM)
 - .1 ASTM C919-08, Standard Practice for Use of Sealants in Acoustical Applications.
 - .2 ASTM C920-11, Standard Specification for Elastomeric Joint Sealants.
- .2 Canadian General Standards Board (CGSB)
 - .1 CGSB 19-GP-5M-1984, Sealing Compound, One Component, Acrylic Base, Solvent Curing (Issue of 1976 reaffirmed, incorporating Amendment No. 1).
 - .1 CAN/CGSB-19.13-M87, Sealing Compound, One-component, Elastomeric, Chemical Curing.
 - .2 CAN/CGSB-19.17-M90, One-Component Acrylic Emulsion Base Sealing Compound.
 - .3 CAN/CGSB-19.22-M89 Mildew Resistant, Sealing Compound for Tubs and Tiles.
 - .4 CAN/CGSB-19.24-M90 Multi-component, Chemical Curing Sealing Compound.
- .3 Department of Justice Canada (Jus)
 - .1 Canadian Environmental Protection Act, 1999 (CEPA).
- .4 Health Canada/Workplace Hazardous Materials Information System (WHMIS)
 - .1 Material Safety Data Sheets (MSDS).
- .5 South Coast Air Quality Management District (SCAQMD), California State, Regulation XI. Source Specific Standards
 - .1 SCAQMD Rule 1168-A2005, Adhesive and Sealant Applications.

1.3 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Submit submittals in accordance with Section 01 33 00.
- .2 Submit Manufacturer's product to describe.
 - .1 Caulking compound.
 - .2 Primers.
 - .3 Sealing compound, each type, including compatibility when different sealants are in contact with each other.
- .3 Submit duplicate samples of each type of material and colour.
- .4 Cured samples of exposed sealants for each color where required to match adjacent material.
- .5 Submit manufacturer's instructions provide manufacturer's installation instructions and special handling criteria, installation sequence, and cleaning procedures for each product used.
- .6 LEED Submittals: provide LEED submittals in accordance with Section 01 47 15:
 - .1 Submit product data for regional materials, certified wood and low emitting materials
 - .2 Submit MSDS sheets indicating the VOC content of interior site applied adhesives, sealants, paints and/or coatings.
 - .3 Submit a LEED Material Submittal Form, to identify recycled content, regional content or VOC emission when required by Submittal Requirements.

1.4 DELIVERY, STORAGE, AND HANDLING

- .1 Deliver, handle, store and protect materials in accordance with Section 01 61 00.
- .2 Comply with requirements of Workplace Hazardous Materials Information System (WHMIS) regarding use, handling, storage, and disposal of hazardous materials; and regarding labelling and provision of Material Safety Data Sheets (MSDS) acceptable to Labour Canada.

- .3 Deliver materials to the site in undamaged condition and in original unopened containers, marked to indicate brand name and manufacturer.
- .4 Deliver materials in clean, dry, well-ventilated area, and in accordance with manufacturer's written instructions.

1.5 PROJECT CONDITIONS

- .1 Environmental Limitations:
 - .1 Do not proceed with installation of joint sealants under following conditions:
 - .1 When ambient and substrate temperature conditions are outside limits permitted by joint sealant manufacturer or are below 4.4 degrees C.
 - .2 When joint substrates are wet.
- .2 Joint-Width Conditions:
 - .1 Do not proceed with installation of joint sealants where joint widths are less than those allowed by joint sealant manufacturer for applications indicated.
- .3 Joint-Substrate Conditions:
 - .1 Do not proceed with installation of joint sealants until contaminants capable of interfering with adhesion are removed from joint substrates.

1.6 ENVIRONMENTAL REQUIREMENTS

- .1 Comply with requirements of Workplace Hazardous Materials Information System (WHMIS) regarding use, handling, storage, and disposal of hazardous materials; and regarding labelling and provision of Material Safety Data Sheets (MSDS) acceptable to Labour Canada.
- .2 Conform to manufacturer's recommended temperatures, relative humidity, and substrate moisture content for application and curing of sealants including special conditions governing use.
- .3 Ventilate area of work as directed by Construction Manager by use of approved portable supply and exhaust fans.

1.7 QUALITY ASSURANCE

- .1 Perform the work by experienced and skilled mechanics thoroughly trained and competent in the use of caulking and sealing equipment and the specified materials with at least five years experience.
- .2 Arrange with the caulking and sealant manufacturers for a visit at the job site by one of their technical representatives before beginning the caulking and sealing installation to discuss with the Contractor and the Construction Manager the procedures to be adopted, to analyse site conditions and inspect the surfaces and joints to be sealed, in order that type of sealant recommendations may be made for typical joint configuration.
- .3 Discuss the following items and provide a written report indicating:
 - .1 Sealants and caulking materials selected for use from those specified;
 - .2 Surface preparation requirements;
 - .3 Priming and application procedures;
 - .4 Verification that sealants and caulking are suitable for purposes intended and joint design;
 - .5 Sealants and caulking are compatible with other materials and products with which they come in contact including but not limited to sealants provided under other Sections, insulation adhesives, bitumens, block, concrete, metals and metal finishes.
 - .6 Verification that sealant and caulking are suitable for temperature and humidity conditions at time of application and will not stain adjacent surfaces;
 - .7 Recommended sealant for each type of joint configuration;
 - .8 Joint design;
 - .9 Anticipated frequency and extent of joint movement.
 - .10 Number of beads to be used in the sealing operation;
 - .11 Suitability of durometer hardness and other properties of material to be used;
 - .12 Weather conditions under which work will be done.

Part 2**Products****2.1****LEED REQUIREMENTS**

- .1 Limits in accordance with Section 01 47 15 – Sustainable Requirements: Construction.
 - .1 Recycled Content Credit MR-4.2.
- .2 Regional materials Credit MR-5.2.
- .3 Low-Emitting Materials: Adhesives and Sealants, Credit EQ-4.1, VOC content to SCAQMD Rule 1168.

2.2**SEALANT MATERIALS**

- .1 Sealant for fireproofing; where cables, conduits, pipes and ducts pass through floors and fire-rated walls, pack space between wiring and sleeve full with penetrating foam sealing system, ULC listed meeting CAN4-S115 and to Section 07 84 00.
- .2 Colours: Colours shall be selected from manufacturer's standard colour range. Colours to match material / background colour upon which they occur. Final colour selection by Construction Manager.
- .3 Do not use caulking that emits strong odours, contains toxic chemicals or is not certified as mould resistant in air handling units.
- .4 When low toxicity caulks are not possible, confine usage to areas which off gas to exterior, are contained behind air barriers, or are applied several months before occupancy to maximize off gas time.
- .5 Where sealants are qualified with primers use only these primers.

2.3**SEALANT MATERIAL DESIGNATIONS**

- .1 Urethanes Multi-Component (Type A): Non-sag to CAN/CGSB-19.24, Type II, Class B, or ASTM C920, Type S, Grade NS, Class 50.
 - .1 Acceptable Manufacturer / Material:
 - .1 Euclid Chemical: Eucolastic II
 - .2 Tremco: Dymeric 240FC
 - .3 Sika: Sikaflex 2C NS.
 - .4 BASF: Sonneborn NP2
- .2 Urethane One Part (Type B): to CAN/CGSB-19.13 or ASTM C920 Type S, Grade NS, Class 50, modified urethane.
 - .1 Acceptable manufacturer /Material:
 - .1 Euclid Chemical: Eucolastic I
 - .2 Sika: Sikaflex 1A.
 - .3 BASF: Sonneborn NP1 or Sonolastic 150 VLM
- .3 Aviation Fuel Resistant (Type C): Not required
- .4 Acrylic One Part (Type D): to CGSB 19-GP-19M.
 - .1 Acceptable Materials:
 - .1 Tremco: Mono 834.
 - .2 Sika:
 - .3 BASF: Sonneborn Sonolac
- .5 Silicone – Exterior (Type E): to ASTM C920, one-part, Type S, Grade NS, Class 50
- .6 Silicone – Interior (Type E1): to ASTM C920, one-part, Type S, Grade NS, Class 25.
- .7 Acoustical Sealant (Type F): to ASTM C919 non-hardening, non-skinning, synthetic rubber.
- .8 Preformed Foam Sealant: non-staining, non-migratory, acrylic impregnated pre-compressed expanding open cell polyurethane foam laminated to closed cell foam, 25% oversized; colour to be selected.
 - .1 Acceptable Manufacturer / Material:
 - .1 Emseal: Colorseal.
 - .2 BASF: Watson Bowman Acme Seismic Weatherseal.
 - .3 Tremco.
 - .4 MMS Systems
- .9 Sealant for exterior wall precast concrete
 - .1 Acceptable material: Tremco Dymonic FC, contains 3g/l volatile organic content.

2.4 ACCESSORIES

- .1 Preformed Compressible and Non-Compressible back-up materials.
 - .1 Polyethylene, Urethane, Neoprene or Vinyl Foam.
 - .1 Extruded closed cell foam backer rod.
 - .2 Size: oversize 30 to 50 %.
 - .2 Neoprene or Butyl Rubber.
 - .1 Round solid rod, Shore A hardness 70.
 - .3 High Density Foam.
 - .1 Extruded closed cell polyvinyl chloride (PVC), extruded polyethylene, closed cell, Shore A hardness 20, tensile strength 140 to 200 kPa, extruded polyolefin foam, 32 kg/m³ density, or neoprene foam backer, size as recommended by manufacturer.
 - .4 Bond Breaker Tape.
 - .1 Polyethylene bond breaker tape which will not bond to sealant.

2.5 SEALANT SELECTION

- .1 Expansion and control joints in exterior surfaces of poured-in-place concrete and unit masonry walls: Sealant Type A.
- .2 Perimeters of exterior openings where frames meet exterior facade of building (i.e. brick, block, precast masonry): Sealant Type B.
- .3 Interior joints in concrete slabs on grade and horizontal wearing surfaces: Sealant Type C.
 - .1 Joints to receive Type C sealant within include but are not limited to slab on grade control joints (including construction joints and slab/wall joints) and saw cut joints.
- .4 Miscellaneous interior joints for painting: Sealant Type D.
- .5 Exterior joints at metal surfaces: Sealant Type E.
- .6 Interior sealing at interior perimeters of exterior openings: Sealant Type E1.
- .7 Control and expansion joints on the interior of exterior poured-in place concrete walls: Sealant Type A.
- .8 Interior masonry vertical control joints (block-to-block, block-to-concrete and intersections at masonry walls): Sealant Type A.
- .9 Perimeter of bath fixtures (e.g. sinks, urinals, water closets, basins: Sealant Type E1 (mildew resistant).
- .10 Acoustic joints: Sealant Type F.

2.6 JOINT CLEANER

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

Part 3 Execution

3.1 PROTECTION

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

3.2 SURFACE PREPARATION

- .1 Examine joint sizes and conditions to establish correct depth to width relationship for installation of backup materials and sealants.
- .2 Clean bonding joint surfaces of harmful matter substances including dust, rust, oil grease, and other matter which may impair Work.
- .3 Do not apply sealants to joint surfaces treated with sealer, curing compound, water repellent, or other coatings unless tests have been performed to ensure compatibility of materials. Remove coatings as required.
- .4 Ensure joint surfaces are dry and frost free.

-
- .5 Prepare surfaces in accordance with manufacturer's directions.

3.3 PRIMING

- .1 Where necessary to prevent staining, mask adjacent surfaces prior to priming and caulking.
- .2 Prime sides of joints in accordance with sealant manufacturer's instructions immediately prior to caulking.
- .3

3.4 BACKUP MATERIAL

- .1 Apply bond breaker tape where required to manufacturer's instructions.
- .2 Install joint filler to achieve correct joint depth and shape, with approximately 30% compression.
- .3

3.5 MIXING

- .1 Mix materials in strict accordance with sealant manufacturer's instructions.
- .2

3.6 APPLICATION

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

END OF SECTION

Part 1 General

1.1 REFERENCES

- .1 American Society for Testing and Materials International (ASTM)
 - .1 ASTM A653/A653M-11, Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.
- .2 Canadian General Standards Board (CGSB)
 - .1 CAN/CGSB-1.181-99, Ready-Mixed Organic Zinc-Rich Coating.
- .3 Canadian Standards Association (CSA International)
 - .1 CSA-G40.20-04/G40.21-04(R2009), General Requirements for Rolled or Welded Structural Quality Steel/Structural Quality Steel.
 - .2 CSA W59-03(R008), Welded Steel Construction (Metal Arc Welding).
- .4 Canadian Steel Door Manufacturers' Association (CSDMA)
 - .1 CSDMA, Recommended Specifications for Commercial Steel Doors and Frames, 2000.
 - .2 CSDMA, Selection and Usage Guide for Commercial Steel Doors, 2009.
- .5 National Fire Protection Association (NFPA)
 - .1 NFPA 80-07, Standard for Fire Doors and Fire Windows.
 - .2 NFPA 252-03, Standard Methods of Fire Tests of Door Assemblies.
- .6 Underwriters' Laboratories of Canada (ULC)
 - .1 CAN/ULC-S701--01, Standard for Thermal Insulation, Polystyrene, Boards and Pipe Covering.
 - .2 CAN/ULC-S104-10, Standard Method for Fire Tests of Door Assemblies.
 - .3 CAN/ULC-S105-09, Standard Specification for Fire Door Frames Meeting the Performance Required by CAN/ULC-S104.

1.2 SYSTEM DESCRIPTION

- .1 Design Requirements:
 - .1 Design exterior frame assembly to accommodate to expansion and contraction when subjected to minimum and maximum surface temperature of -35 degrees C to 35 degrees C.
 - .2 Maximum deflection for exterior steel entrance screens under wind load of 1.2 kPa not to exceed 1/175th of span.
 - .3 Steel fire rated doors and frames: labelled and listed by an organization accredited by Standards Council of Canada in conformance with CAN4-S104, NFPA 252 for ratings specified or indicated.
 - .4 Provide fire labelled frames for openings requiring fire protection ratings. Test products in conformance with CAN/ULC-S104, ASTM E152 or NFPA 252 and listed by nationally recognized agency having factory inspection services.

1.3 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Provide submittals in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Submit shop drawings.
 - .1 Indicate each type of door, material, steel core thicknesses, mortises, reinforcements, location of exposed fasteners, openings, glazed, louvered, arrangement of hardware and fire rating and finishes.
 - .2 Indicate each type frame material, core thickness, reinforcements, glazing stops, location of anchors and exposed fastenings and reinforcing fire rating finishes.
 - .3 Include schedule identifying each unit, with door marks and numbers relating to numbering on drawings and door schedule.
 - .4 Submit test and engineering data, and installation instructions.
- .3 Submit one 300 x 300 mm corner sample of each type of frame.

1.4 DELIVERY, STORAGE AND HANDLING

- .1 Deliver, store and handle materials in accordance with Section 01 60 00 - Common Product Requirements.

Part 2**Products****2.1****MATERIALS**

- .1 Hot dipped galvanized steel sheet: to ASTM A653M, ZF75, minimum base steel thickness in accordance with CSDMA Table 1 - Thickness for Component Parts.
- .2 Reinforcement channel: to CSA G40.20/G40.21, Type 44W, coating designation to ASTM A653M, ZF75.

2.2**DOOR CORE MATERIALS**

- .1 Fill voids between stiffeners of interior doors with temperature rise rated core.
- .2 Stiffened: face sheets laminated, welded, insulated, core.
 - .1 Polyurethane: to CAN/ULC-S701 rigid, closed cell board. Density 32 kg/m³.
- .3 Temperature rise rated (TRR): core composition to limit temperature rise on unexposed side of door to 250 degrees C at 30, 60 minutes in accordance with NBC. Core to be tested as part of a complete door assembly, in accordance with CAN4-S104, ASTM E152 or NFPA 252, covering Standard Method of Tests of Door Assemblies and listed by nationally recognized testing agency having factory inspection service.

2.3**ADHESIVES**

- .1 Polyurethane cores: heat resistant, epoxy resin based, low viscosity, contact cement.
- .2 Lock-seam doors: fire resistant, resin reinforced polychloroprene, high viscosity, sealant/adhesive.

2.4**PRIMER**

- .1 Touch-up prime CAN/CGSB-1.181.

2.5**PAINT**

- .1 Field paint steel doors and frames in accordance with Section 09 90 00 Painting. Protect weatherstrips from paint. Provide final finish free of scratches or other blemishes.

2.6**ACCESSORIES**

- .1 Door silencers: single stud rubber/neoprene type.
- .2 Exterior and interior top and bottom caps: steel.
- .3 Fabricate glazing stops as formed channel, minimum 5/8" (16 mm) height, accurately fitted, butted at corners and fastened to frame sections with counter-sunk oval head sheet metal screws.
- .4 Make provisions for glazing s indicated and provide necessary glazing stops.
 - .1 Design exterior glazing stops to be tamperproof.

2.7**FRAMES FABRICATION GENERAL**

- .1 Fabricate frames in accordance with CSDMA specifications.
- .2 Fabricate frames to profiles and maximum face sizes as indicated.
- .3 Exterior frames: 16 ga (1.6 mm) welded, thermally broken type construction.
- .4 Interior frames: 18 ga (1.2 mm) welded, knocked-down type construction as indicated.
- .5 Blank, reinforce, drill and tap frames for mortised, templated hardware, and electronic hardware using templates provided by finish hardware supplier. Reinforce frames for surface mounted hardware.
- .6 Protect mortised cutouts with steel guard boxes.
- .7 Prepare frame for door silencers, 3 for single door, 2 at head for double door.
- .8 Manufacturer's nameplates on frames and screens are not permitted.
- .9 Conceal fastenings except where exposed fastenings are indicated.
- .10 Provide factory-applied touch up primer at areas where zinc coating has been removed during fabrication.
- .11 Insulate exterior frame components with polyurethane insulation.

2.8 FRAME ANCHORAGE

- .1 Provide appropriate anchorage to floor and wall construction.
- .2 Locate each wall anchor immediately above or below each hinge reinforcement on hinge jamb and directly opposite on strike jamb.
- .3 Provide 2 anchors for rebate opening heights up to 60" (1520 mm) and 1 additional anchor for each additional 30" (760 mm) of height or fraction thereof.
- .4 Locate anchors for frames in existing openings not more than 6" (150 mm) from top and bottom of each jambs and intermediate at 24" (600 mm) on centre maximum.

2.9 FRAMES: WELDED TYPE

- .1 Welding in accordance with CSA W59.
- .2 Accurately mitre or mechanically joint frame product and securely weld on inside of profile.
- .3 Cope accurately and securely weld butt joints of mullions, transom bars, centre rails and sills.
- .4 Grind welded joints and corners to a flat plane; fill with metallic paste and sand to uniform smooth finish.
- .5 Securely attach floor anchors to inside of each jamb profile.
- .6 Weld in 2 temporary jamb spreaders per frame to maintain proper alignment during shipment.

2.10 DOOR FABRICATION GENERAL

- .1 Doors: swing type, flush, with provision for glass and/or louvre openings as indicated.
- .2 Exterior doors: insulated bonded core construction. Interior doors: hollow steel construction.
- .3 Fabricate doors with longitudinal edges welded. Seams: grind welded joints to a flat plane; fill with metallic paste filler and sand to a uniform smooth finish.
- .4 Blank, reinforce, drill doors and tap for mortised, templated hardware and electronic hardware.
- .5 Factory prepare holes ½" (12.7 mm) diameter and larger except mounting and through-bolt holes, on site, at time of hardware installation.
- .6 Reinforce doors where required, for surface mounted hardware. Provide flush steel top caps to exterior doors. Provide inverted, recessed, spot welded channels to top and bottom of interior doors.
- .7 Provide factory-applied touch-up primer at areas where zinc coating has been removed during fabrication.
- .8 Provide fire labelled doors for those openings requiring fire protection ratings, as scheduled. Test such products in conformance with CAN4-S104, ASTM E152 or FPA 252 and list by nationally recognized agency having factory inspection service and construct as detailed in Follow-Up Service Procedures/Factory Inspection Manuals issued by listing agency to individual manufacturers.
- .9 Manufacturer's nameplates on doors are permitted. Location of nameplates to be on hinge side of door concealed from view.

2.11 HOLLOW STEEL CONSTRUCTION

- .1 Form face sheets for exterior doors from 18 ga (1.6mm) sheet steel.
- .2 Form face sheets for interior doors from 16 ga (1.2 mm) sheet steel.
- .3 Reinforce doors with vertical stiffeners, securely welded to face sheets at 6" (150 mm) on centre maximum.
- .4 Fill voids between stiffeners of exterior doors with polyurethane core.
- .5 Fill voids between stiffeners of interior doors with temperature rise rated core.

2.12 THERMALLY BROKEN DOORS AND FRAMES

- .1 Fabricate thermally broken doors by using insulated core and separating exterior parts from interior parts with continuous interlocking thermal break.
- .2 Thermal break: rigid polyvinylchloride extrusion conforming to CGSB 41-GP-19Ma.

- .3 Fabricate thermally broken frames separating exterior parts from interior parts with continuous interlocking thermal break.
- .4 Apply Polyisocyanurate insulation.

Part 3 Execution

3.1 MANUFACTURER'S INSTRUCTIONS

- .1 Compliance: comply with manufacturer's written recommendations or specifications, including product technical bulletins, handling, storage and installation instructions, and datasheets.

3.2 INSTALLATION GENERAL

- .1 Install labelled steel fire rated doors and frames to NFPA 80 except where specified otherwise.
- .2 Install doors and frames to CSDMA Installation Guide.

3.3 FRAME INSTALLATION

- .1 Set frames plumb, square, level and at correct elevation.
- .2 Secure anchorages and connections to adjacent construction.
- .3 Brace frames rigidly in position while building-in. Install temporary horizontal wood spreader at third points of door opening to maintain frame width. Provide vertical support at centre of head for openings over 48" (1200 mm) wide. Remove temporary spreaders after frames are built-in.
- .4 Make allowances for deflection of structure to ensure structural loads are not transmitted to frames.
- .5 Caulk perimeter of frames between frame and adjacent material. Maintain continuity of air barrier and vapour retarder.

3.4 DOOR INSTALLATION

- .1 Install doors and hardware in accordance with hardware templates and manufacturer's instructions and Section 08 71 00 - Door Hardware.
- .2 Provide even margins between doors and jambs and doors and finished floor and thresholds as follows.
 - .1 Hinge side: 1/32" (1.0 mm).
 - .2 Latchside and head: 1/16" (1.5 mm).
 - .3 Finished floor, top of carpet noncombustible sill and thresholds: 13 mm.
- .3 Adjust operable parts for correct function.
- .4 Install louvres.

3.5 FINISH REPAIRS

- .1 Touch up with primer finishes damaged during installation. Fill exposed frame anchors and surfaces with imperfections with metallic paste filler and sand to a uniform smooth finish.

3.6 GLAZING

- .1 Install glazing for doors in accordance with Section 08 80 50 – Glazing.

END OF SECTION

Part 1 General

1.1 REFERENCES

- .1 Aluminum Association (AA).
 - .1 DAF 45-03, Designation System for Aluminum Finishes.
- .2 American Architectural Manufacturers Association (AAMA).
 - .1 AAMA 609-09, Voluntary Guide Specification for Cleaning and Maintenance of Architectural Anodized Aluminum.
- .3 American Society for Testing and Materials International, (ASTM).
 - .1 ASTM A653/A653M-11, Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.
 - .2 ASTM E330-02(2010), Standard Test Method for Structural Performance of Exterior Windows, Doors, Skylights and Curtain Walls by Uniform Static Air Pressure Difference.
- .4 Canadian General Standards Board (CGSB).
 - .1 CGSB 1.40-97, Primer, Structural Steel, Oil Alkyd Type.
 - .2 CAN/CGSB-12.1-M90, Tempered or Laminated Safety Glass.
 - .3 CAN/CGSB-12.20-M89, Structural Design of Glass for Buildings.
- .5 Canadian Standards Association (CSA International).
 - .1 CAN/CSA-G40.20-04/G40.21-04(R2009), General Requirements for Rolled or Welded Structural Quality Steel/Structural Quality Steel.

1.2 SYSTEM DESCRIPTION

- .1 Design Criteria.
 - .1 Design frames and doors in walls to:
 - .1 Accommodate expansion and contraction within service temperature range of -35 to 35 degrees C.
 - .2 Limit deflection of mullions to maximum 1/175th of clear span when tested to ASTM E330 under wind load of 1.2 kpa.
 - .3 Movement within system.
 - .4 Movement between system and perimeter framing components or substrate.
- .2 Size glass thickness and glass unit dimensions to limits in accordance with CAN/CGSB-12.20.

1.3 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Submit submittals in accordance with Section 01 33 00 - Submittal Procedures
- .2 Submit manufacturer's printed product literature, specifications and data sheets.
- .3 Submit shop drawings: Indicate materials and profiles and provide full-size, scaled details of components for each type of door and frame. Indicate:
 - .1 Interior trim and exterior junctions with adjacent construction.
 - .2 Junctions between combination units.
 - .3 Elevations of units.
 - .4 Core thicknesses of components.
 - .5 Type and location of exposed finishes, method of anchorage, number of anchors, supports, reinforcement, and accessories.
 - .6 Location of caulking.
 - .7 Each type of door system including location.
 - .8 Arrangement of hardware and required clearances.
- .4 Submit catalogue details for each type of door and frame illustrating profiles, dimensions and methods of assembly.
- .5 Submit one 12" x 12" (300 x 300 mm) corner sample of each type door and frame.
- .6 Submit sample showing glazing detail, reinforcement, finish and location of manufacturer's nameplates.
- .7 Frame sample to show glazing stop, door stop, jointing detail, finish.
- .8 Manufacturer's Instructions: Submit manufacturer's installation instructions.

- .9 Provide maintenance data for cleaning and maintenance of aluminum finishes for incorporation into manual specified in Section 01 00 02.

1.4 DELIVERY, STORAGE, AND HANDLING

- .1 Storage and Protection:
 .1 Apply temporary protective coating to finished surfaces. Remove coating after erection. Do not use coatings that will become hard to remove or leave residue.
 .2 Leave protective covering in place until final cleaning of building.

Part 2 Products

2.1 MATERIALS

- .1 Aluminum extrusions: Aluminum Association alloy AA6063-T5 or T6 anodizing quality.
 .2 Sheet aluminum: Aluminum Association alloy anodizing quality.
 .3 Steel reinforcement: to CAN/CSA-G40.20/G40.21, grade 300 W.
 .4 Fasteners: aluminum and stainless steel, finished to match adjacent material.
 .5 Isolation coating: bituminous paint.
 .6 Glass: tempered glass to Section 08 80 50.
 .7 Sealants: in accordance with Section 07 92 00.

2.2 ALUMINUM DOORS

- .1 Interior: Construct frames of aluminum extrusions 44.5 mm thick
 .1 Alumicor 600
 .2 Exterior: Construct frames of aluminum extrusions 57.2 mm thick
 .1 Alumicor 600A insulated
 .3 All Aluminum doors by same manufacturer.
 .4 Hardware: as indicated in schedule.

2.3 ALUMINUM FRAMES

- .1 Aluminum frames by same manufacturer as aluminum doors.
 Interior:
 .1 Alumicor 1800 Series 1 ¾ x 4 1.2, Alumicor versa wall 2500 3.5/8 series as Indicated.
 .2 Exterior:
 .1 Alumicor versa wall 2500 series.

2.4 ALUMINUM FINISHES

- .1 Finish coatings: conform to AA designations.
 .2 Exterior exposed aluminum surfaces: AAMA AA , clear anodized
 .3 Interior exposed aluminum surfaces: AAMA AA colour as selected by Construction Manager clear anodized
 .4 Touch-up primer for galvanized steel surfaces: SSPC 20 Paint zinc rich.
 .5 Concealed steel items: galvanized in accordance with ASTM A123 to 600 gm/m². Primed with iron oxide paint.
 .6 Apply two coats of bituminous paint to concealed aluminum and steel surfaces in contact with cementitious or dissimilar materials.

2.5 STEEL FINISHES

- .1 Finish steel clips and reinforcing steel with zinc coating to ASTM A653/A653M.

2.6 FABRICATION

- .1 Doors and framing to be by same manufacturer.
 .2 Fabricate doors and frames to profiles and maximum face sizes as shown. Provide structural steel reinforcement as required.

- .3 Fit joints tightly and secure mechanically.
- .4 Conceal fastenings.
- .5 Mortise, reinforce, drill and tap doors, frames and reinforcements to receive hardware using templates provided under Section 08 71 00 - Door Hardware – General.
- .6 Isolate aluminum from direct contact with dissimilar metals, concrete and masonry.

Part 3 Execution

3.1 MANUFACTURER'S INSTRUCTIONS

- .1 Compliance: comply with manufacturer's written data, including product technical bulletins, product catalogue installation instructions, product carton installation instructions, and data sheets.

3.2 INSTALLATION

- .1 Set frames plumb, square, level at correct elevation in alignment with adjacent work.
- .2 Anchor securely.
- .3 Install doors and hardware in accordance with hardware templates and manufacturer's instructions.
- .4 Adjust operable parts for correct function.
- .5 Make allowances for deflection of structure to ensure that structural loads are not transmitted to frames.

3.3 GLAZING

- .1 Glaze aluminum doors and frames in accordance with Section 08 80 50 – Glazing

3.4 CAULKING

- .1 Apply sealant in accordance with Section 07 92 00 - Joint Sealants. Conceal sealant within the aluminum work except where exposed use is permitted by Construction Manager.

3.5 CLEANING

- .1 Perform cleaning of aluminum components in accordance with AAMA 609.1 - Voluntary Guide Specification for Cleaning and Maintenance of Architectural Anodized Aluminum.
- .2 Perform cleaning as soon as possible after installation to remove construction and accumulated environmental dirt.
- .3 Clean aluminum with damp rag and approved non-abrasive cleaner.
- .4 Remove traces of primer, caulking, epoxy and filler materials; clean doors and frames.
- .5 Clean glass and glazing materials with approved non-abrasive cleaner.
- .6 Upon completion of installation, remove surplus materials, rubbish, tools and equipment barriers.

END OF SECTION

Part 1 General

1.1 REFERENCES

- .1 Architectural Woodwork Manufacturers Association of Canada (AWMAC)
- .1 Architectural Woodwork Standards 1st Edition 2009 (AWS).

1.2 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Submit submittals in accordance with Section 01 33 00 Submittals.
- .2 Product Data: indicate door core materials and construction; veneer species, type and characteristics.
- .3 Shop Drawing: Illustrate door opening criteria, elevations, sizes, types, swings, undercuts required, special bevelling, special blocking for hardware, factory machining criteria, identify cut-outs for glazing.
- .4 Samples: Submit two samples of door veneer, illustrating wood grain stain colour and sheen.

1.3 DELIVERY, STORAGE, AND PROTECTION

- .1 Package, deliver and store doors in accordance with AWMAC.
- .2 Protect doors with resilient packaging. Do not store in damp or wet areas; or in areas where sunlight might bleach veneer. Seal top and bottom edges if stored more than one week. Break seal on site to permit ventilation.

1.4 WARRANTY

- .1 Provide 1 year warranty.
- .2 Include coverage for delamination of veneer, warping beyond specified installation tolerance, defective materials, telegraphing core construction.

Part 2 Products

2.1 DOOR CONSTRUCTION

- .1 Solid core, non-rated with wood lock blocks.

2.2 DOOR FACING

- .1 Hardwood birch veneer.

2.3 ADHESIVE

- .1 Facing adhesive II – water resistant.

2.4 FABRICATION

- .1 Fabricate non-rated doors in accordance with AWMAC, Custom Grade Quality Standards requirements.
- .2 Vertical exposed edges of stiles: of same species as veneer facing.
 - .1 Door edge detail to manufacturer's standard details as selected by Construction Manager.
- .3 Bond edge banding to cores
- .4 Factory machine doors for finish hardware in accordance with hardware requirements and dimensions. Do not machine for surface hardware.
- .5 Provide edge clearances in accordance with AWMAC.

Part 3 Execution

3.1 EXAMINATION

- .1 Verify that opening sizes and tolerances are acceptable.
- .2 Do not install door in frame openings that are not plumb or are out-of-tolerance for size or alignment.

3.2 INSTALLATION

- .1 Install doors in accordance with manufacturer's instructions.
- .2 Install all work in conformance with the A Architectural Woodwork Standards 1stEdition2009 (AWS).
- .2 Doors to be secured in place, square, plumb and level
- .3 Coordinate installation of doors with installation of frames specified in Section 08 11 00 and hardware specified in Section 08 71 00.

3.3 INSTALLATION TOLERANCES

- .1 Conform to AWMAC requirements for fit and clearance tolerances.

3.4 ADJUSTING AND TOUCH UP

- .1 Adjust operable parts for correct function of smooth and balanced door movement.
- .2 All nicks, chips and scratches in the finish to be filled and retouched. Damaged items which cannot be repaired shall be replaced.

END OF SECTION

Part 1 General

1.1 REFERENCES

- .1 South Coast Air Quality Management District (SCAQMD), California State, Regulation XI. Source Specific Standards
 - .1 SCAQMD Rule 1113-A2007, Architectural Coatings.

1.2 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Submit in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Product Data: Submit manufacturer's instructions, printed product literature and data sheets for access door components and include product characteristics, performance criteria, physical size, finish and limitations.
- .3 Shop Drawings: Submit catalogue details for each type of door illustrating profiles, dimensions and methods of assembly.
- .4 Samples:
 - .1 Submit for review and acceptance of each unit.
 - .2 Samples will be returned for inclusion into work.
 - .3 Submit one 300 x 300 mm corner sample of each type of body entry door.

1.3 CLOSEOUT SUBMITTALS

- .1 Submit in accordance with Section 01 78 00 - Closeout Submittals.
- .2 Operation and Maintenance Data: submit operation and maintenance data for cleaning and maintenance of stainless steel finishes for incorporation into manual.

1.4 DELIVERY, STORAGE AND HANDLING

- .1 Deliver, store and handle materials in accordance with Section 01 61 00 - Common Product Requirements and with manufacturer's written instructions.
- .2 Delivery and Acceptance Requirements: deliver materials to site in original factory packaging, labelled with manufacturer's name and address.
- .3 Storage and Handling Requirements:
 - .1 Store materials indoors in dry location and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.
 - .2 Store and protect access doors from nicks, scratches, and blemishes.
 - .3 Apply temporary protective coating to finished surfaces. Remove coating after installation.
 - .1 Use coatings in accordance with manufacturer's written instructions that are easily removable.
 - .2 Leave protective coating in place until final cleaning of building.
 - .4 Replace defective or damaged materials with new.
- .4 Packaging Waste Management: remove for reuse and return by manufacturer of pallets, crates, padding, and packaging materials as specified in Construction Waste Management Plan, Waste Reduction Workplan in accordance with Section 01 74 19 - Construction/Demolition Waste Management and Disposal and Section 01 47 15 - LEED Requirements.

Part 2 Products

2.1 ACCESS DOORS

- .1 Sizes: as follows unless indicated:
 - .1 For body entry: 600 x 600 mm minimum.
- .2 Construction: rounded safety corners, concealed hinges, screwdriver latch, anchor straps, able to open 180 degrees.
- .3 Materials: prime coated steel.
 - .1 Primer: VOC limit 50 g/L maximum to SCAQMD Rule 1113.

Part 3 Execution

3.1 EXAMINATION

- .1 Verification of Conditions: verify conditions of substrates previously installed under other Sections or Contracts are acceptable for access door installation in accordance with manufacturer's written instructions.
 - .1 Visually inspect substrate in presence of Construction Manager.
 - .2 Inform Construction Manager of unacceptable conditions immediately upon discovery.
 - .3 Proceed with installation only after unacceptable conditions have been remedied and after receipt of written approval to proceed from Construction Manager.

3.2 INSTALLATION

- .1 Installation: locate access doors within view of equipment and ensure equipment is accessible for operating, inspecting, adjusting, servicing without using special tools.
 - .1 Install masonry surfaces: in accordance with Section 04 05 00 - Common Work Results for Masonry.
 - .2 Install gypsum board surfaces: in accordance with Section 09 21 16 - Gypsum Board Assemblies.

3.3 CLEANING

- .1 Progress Cleaning: clean in accordance with Section 01 74 11 - Cleaning.
- .2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 74 11 - Cleaning.
- .3 Waste Management: separate waste materials for reuse and recycling in accordance with Section 01 74 19 - Construction/Demolition Waste Management and Disposal, 01 47 15 - LEED Requirements.

3.4 PROTECTION

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

END OF SECTION

Part 1 General

1.1 REFERENCES

- .1 ASTM International
 - .1 ASTM A480/480M-11b, Standard Specification for General Requirements for Flat-Rolled Stainless and Heat-Resisting Steel Plate, Sheet and Strip.

1.2 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Submit in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Product Data: Submit manufacturer's instructions, printed product literature and data sheets for coiling counter doors and hardware and include product characteristics, performance criteria, physical size, finish and limitations.
- .3 Shop Drawings:
 - .1 Submit drawings stamped and signed by professional engineer registered or licensed in Province of Manitoba, Canada.
 - .2 Indicate each type of coiling counter door, arrangement of hardware, operating mechanism and required clearances.
- .4 Samples:
 - .1 Submit for review and acceptance of each unit.
 - .2 Samples will be returned for inclusion into work.
 - .3 Submit duplicate 300 mm long pieces of coiling curtain slats, guides.

1.3 CLOSEOUT SUBMITTALS

- .1 Submit in accordance with Section 01 00 02.
- .2 Operation and Maintenance Data: submit operation and maintenance data for coiling counter doors and hardware for incorporation into manual.

1.4 DELIVERY, STORAGE AND HANDLING

- .1 Deliver, store and handle materials in accordance with Section 01 60 00 and with manufacturer's written instructions.
- .2 Delivery and Acceptance Requirements: deliver materials to site in original factory packaging, labelled with manufacturer's name and address.
- .3 Storage and Handling Requirements:
 - .1 Store materials indoors in dry location and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.
 - .2 Store and protect coiling counter doors from nicks, scratches, and blemishes.
 - .3 Replace defective or damaged materials with new.

Part 2 Products

2.1 MATERIALS

- .1 Coiling doors.
- .2 Galvanized steel sheet: lock-forming quality, Coating Designation Z001 or ZF001, mill phosphatized:
 - .1 Locations: as indicated.

2.2 COILING COUNTER DOORS

- .1 Assemble coiling counter door curtain flat roll formed steel interlocking slat sections.
- .2 Provide bottom bar of steel.
- .3 Form guides of metal angles, sections of 5 mm minimum thickness for between jambs, face wall installation.
- .4 Construct counterbalance assembly consisting of torsion spring with 25% overload factor. Enclose spring in steel pipe to support door curtain and counterbalance mechanism with maximum deflection of 1/360th of opening width. Provide ball bearings at rotating points. Provide spring tension adjusting wheel, accessible for setting.

- .1 Enclose spring in steel pipe to support door curtain and counterbalance mechanism with maximum deflection of 1/360th of opening width.
- .2 Use ball bearings at rotating points.
- .3 Use spring tension adjusting wheel, accessible for setting.
- .5 Support counterbalance assembly on 5 mm minimum thickness steel plate brackets, forming end enclosures.
- .6 Enclose counter balance assembly with galvanized steel sheet formed hood.
- .7 Attach to hood sheet metal flame and smoke baffle to drop in place automatically when activated.
- .8 Equip coiling doors for locking from inside with cylinder locks for master keyed cylinder, in accordance with Section 08 71 00 - Door Hardware.

2.3 OPERATION

- .1 Equip coiling counter doors for operation by:
 - .1 Hand, install 2 lift handles at coiling counter door bottom on inside face of coiling counter door or provide continuous extruded lifting strip.
 - .2 Crank operator with removable hand crank.

Part 3 Execution

3.1 EXAMINATION

- .1 Verification of Conditions: verify conditions of substrates previously installed under other Sections or Contracts are acceptable for coiling counter doors installation in accordance with manufacturer's written instructions.
 - .1 Visually inspect substrate in presence of Construction Manager.
 - .2 Inform Construction Manager of unacceptable conditions immediately upon discovery.
 - .3 Proceed with installation only after unacceptable conditions have been remedied and after receipt of written approval to proceed from Construction Manager.

3.2 INSTALLATION

- .1 Install coiling counter door in accordance with manufacturers' printed instructions.
- .2 Install master keyed cylinders specified in Section 08 71 00 - Door Hardware.
- .3 Adjust operable parts for correct function and smooth operation.

3.3 CLEANING

- .1 Progress Cleaning:
 - .1 Leave Work area clean at end of each day.
 - .2 Remove traces of primer, caulking; clean doors and frames.
- .2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment.
- .3 Waste Management: separate waste materials for reuse and recycling in accordance with Section 01 74 19 - Construction/Demolition Waste Management and Disposal.

3.4 PROTECTION

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

END OF SECTION

Part 1 General**1.1 REFERENCES**

- .1 American Society for Testing and Materials International, (ASTM).
 - .1 ASTM A653/A653M-11, Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.
 - .2 ASTM A1008/A1008M-02e1, Standard Specification for Steel, Sheet, Cold-Rolled, Carbon, Structural, High-Strength Low-Alloy and High-Strength Low-Alloy with Improved Formability.

1.2 SYSTEM DESCRIPTION

- .1 Design Requirements.
 - .1 Design exterior door assembly to withstand wind load of 2 kPa with a maximum horizontal deflection of 1/240 of opening width..
 - .2 Design door panel assemblies with a minimum thermal insulation factor of 3.0 RSI and .41 mm steel sheet panels with 1.6 mm steel end caps.
 - .3 Design door assembly to withstand minimum 100,000 open close cycles per annum..

1.3 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Submit submittals in accordance with Section 01 33 00.
- .2 Product Data: Submit manufacturer's printed product literature, specifications and data sheet.
- .3 Shop Drawings: Indicate sizes, service rating, types, materials, operating mechanisms, glazing locations and details, hardware and accessories, required clearances and electrical connections.
- .4 Manufacturer's Instructions: Submit manufacturer's installation instructions
- .5 Closeout submittals: Provide operation and maintenance data for overhead door hardware for incorporation into manual.

1.4 QUALITY ASSURANCE

- .1 Certificates: product certificates signed by manufacturer certifying materials comply with specified performance characteristics and criteria and physical requirements.
- .2 Pre-Installation Meetings: conduct pre-installation meeting to verify project requirements, manufacturer's installation instructions and manufacturer's warranty requirements.

Part 2 Products**2.1 MATERIALS**

- .1 Steel sheet: commercial quality to ASTM A1008/A1008M, with factory finish.
- .2 Insulation: 3.0 RSI.
- .3 Glazing: to Section 08 80 50.

2.2 DOORS

- .1 Fabricate 50 mm thick insulated flush panel doors of roll formed steel sections ribbed exterior surface.
- .2 Fabricate panel frames from 1.6 mm CRS in a continuous box frame with vertical stiffeners at 300 mm centres.
- .3 Fabricate sections from single sheet galvanized steel sheet faces. Roll horizontal meeting edges to form continuous shiplap, rabbeted or keyed weather seal.
- .4 Assemble components by means of spot or arc welding or coated rivet system or adhesive and self tapping screws to manufacturer's recommendations.
- .5 Lap door openings by 100 mm each side.
- .6 Fabricate doors from pre-painted steel stock.

2.3 HEAVY DUTY HARDWARE

- .1 Track: standard hardware with 75 mm size minimum 2.6 mm core thickness galvanized steel track.
- .2 Track Supports: 2.3 mm core thickness continuous galvanized steel angle track supports.
- .3 Spring counter balance: heavy duty oil tempered torsion spring with manufacturers standard brackets.
 - .1 Drum: 200 mm diameter.
 - .2 Shaft: 32 mm diameter galvanized steel.
- .4 Top roller carrier: galvanized steel minimum 2.28 mm thick adjustable.
- .5 Rollers: full floating, grease packed, hardened steel, ball bearing minimum 75 mm diameter, stamped tire.
- .6 Roller brackets: adjustable, galvanized steel, minimum 2.5 mm thick.
- .7 Hinges: heavy duty minimum 3.4 mm thick galvanized as recommended by manufacturer.
- .8 Cable: minimum 6 mm diameter galvanized steel aircraft cable.

2.4 ACCESSORIES

- .1 Overhead horizontal track and operator supports: galvanized steel, type and size to suit installation.
- .2 Track guards: 5 mm thick formed sheet 1500 mm high track guards.
- .3 Pusher springs.
- .4 Two horizontal sliding lock bolts on interior.
- .5 Weather stripping.
 - .1 Sills: bulb type full width extruded neoprene weatherstrip.
 - .2 Jambs and head: extruded aluminum and arctic grade vinyl weatherstrip to manufacturer's standard.
- .6 Finish ferrous hardware items with minimum zinc coating of 300 g/m² to ASTM A653/A653M.

2.5 FINISH

- .1 Factory pre-finish door panels after fabrication to custom colour selected by Construction Manager.
- .2 Coating to conform to CGSB 93-GP-3M as follows.
 - .1 Interior 0.2 mil white polyester wash coat.
 - .2 Exterior: two coat system consisting of 0.2 mil epoxy primer coat and 0.7 mil acrylic finish coat.
 - .3 Site re-finish damaged panels with compatible coating.

2.6 OPERATORS

- .1 Equip doors for operation by:
 - .1 Electric operator with galvanized chain hoist override.
 - .2 Electrical jack shaft side mount type operator.
- .2 Cable fail safe device.
 - .1 Able to stop door immediately if cable breaks on door free fall. Braking capacity 500 kg.

2.7 ELECTRICAL OPERATOR

- .1 Electrical jack shaft type operator.
- .2 Electrical motors, controller units, remote pushbutton stations, relays and other electrical components: to CSA approval.
- .3 Power supply: 208 V, 3 phase 60 Hz.
 - .1 Motor: sized for opening size and class for exposure rating of room..
- .4 Controller units with integral motor reversing starter, solenoid operated brake 3 heater elements for overload protection, including pushbuttons and control relays as applicable.

- .5 Operation:
 - .1 Remote pushbutton stations: surface mounted, in 1 location per door, with "OPEN-STOP-CLOSE" designations on pushbuttons in English.
- .6 Safety switch: combination roll rubber with limit switches for full length of bottom rail of bottom section of door, to reverse door to open position when coming in contact with object on closing cycle.
- .7 For jack shaft operators:
 - .1 Provide floor level disconnect device to allow for manual operation in event of power failure.
 - .2 Equip Operator with:
 - .1 Electrical interlock switch to disconnect power to operator when in manual operation.
 - .2 Built-in chain hoist for manual operation in event of power failure.
- .8 Door speed: 300 mm per second.
- .9 Control transformer: for 24 VAC control voltage.
- .10 Mounting brackets: galvanized steel, size and gauge to suit conditions.

Part 3 Execution

3.1 MANUFACTURER'S INSTRUCTIONS

- .1 Compliance: comply with manufacturer's written data, including product technical bulletins, product catalogue installation instructions, product carton installation instructions, and data sheets.

3.2 INSTALLATION

- .1 Install doors and hardware in accordance with manufacturer's instructions.
- .2 Install glazing for vision panels. Sizes and number of vision panels as indicated.
- .3 Rigidly support rail and operator and secure to supporting structure.
- .4 Touch-up pre finished steel doors with where finish is damaged during installation.
- .5 Install operator including electrical motors, controller units, pushbutton stations, relays and other electrical equipment required for door operation. Connect to power supply.
- .6 Lubricate and adjust door operating components to ensure smooth opening and closing of doors.
- .7 Adjust weatherstripping to form a weather tight seal.
- .8 Adjust doors for smooth operation.

3.3 CLEANING

- .1 Perform cleaning after installation to remove construction and accumulated environmental dirt.
- .2 Remove traces of primer, caulking; clean doors and frames.

END OF SECTION

Part 1 General**1.1 REFERENCES**

- .1 Aluminum Association Designation System For Aluminum Finishes (AA) - 1997.
 - .1 DAF 45 03(R2009), Designation System For Aluminum Finishes.
- .2 American Architectural Manufacturers Association (AAMA).
 - .2 AAMA CW-DG-1-96, Aluminum Curtain Wall Design Guide Manual.
 - .3 AAMA CW-10-04, Care and Handling of Architectural Aluminum from Shop to Site.
 - .4 AAMA CW-11-85, Design Wind Loads for Buildings and Boundary Layer Wind Tunnel Testing.
 - .5 AAMA T1R-A1-02, Sound Control for Fenestration Products.
 - .6 AAMA 501-04, Methods of Test for Exterior Walls.
- .3 American Society for Testing and Materials International, (ASTM).
 - .7 ASTM B209-02a, Specification for Aluminum and Aluminum-Alloy Sheet and Plate.
 - .8 ASTM B221-02, Specification for Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes.
 - .9 ASTM E283-91(1999), Test Method for Determining the Rate of Air Leakage Through Exterior Windows, Curtain Walls, and Doors Under Specified Pressure Differences Across the Specimen.
 - .10 ASTM E330-02, Standard Test Method for Structural Performance of Exterior Windows, Doors, Skylights, and Curtain Walls, by Uniform Static Air Pressure Difference.
 - .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.
 - .12 ASTM E413-04, Classification for Rating Sound Insulation.
 - .13 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.
- .4 Canadian Standards Association (CSA International).
 - .14 CAN/CSA-S157, Strength Design in Aluminum.
 - .15 CSA W59.2-M1991 (R2008), Welded Aluminum Construction.

1.2 SYSTEM DESCRIPTION

- .1 Vertical glazed aluminum curtain wall/storefront system includes thermally broken tubular aluminum sections with self supporting, supplementary support framing, shop fabricated, factory prefinished, vision glass, related flashings, anchorage and attachment devices.
- .2 Assembled system to permit re-glazing of individual glass units without requiring removal of structural mullion sections.

1.3 PERFORMANCE REQUIREMENTS

- .1 Design and size components to withstand dead and live loads caused by pressure and suction of wind, acting normal to plane of system as calculated in accordance with NBC.
- .2 Design and size components to withstand seismic loads and sway displacement as calculated in accordance with NBC.
- .3 Size glass units and glass dimensions to limits established in CAN/CGSB-12.20.
- .4 Provide system to accommodate, without damage to components or deterioration of seals:
 - .1 Movement within system.
 - .2 Movement between system and perimeter framing components.
 - .3 Dynamic loading and release of loads.
 - .4 Deflection of structural support framing.
 - .5 Shortening of building concrete structural columns.
 - .6 Creep of concrete structural members.

- .5 Limit air infiltration through assembly to $.025 \text{ m}^3/\text{s}/\text{m}^2$ of wall area, measured at a reference differential pressure across assembly of 75 Pa as measured in accordance with AAMA 501 AND ASTM E283.
- .6 Vapour seal with interior atmospheric pressure of 25 mm sp, 22 degrees C, 40% RH: No failure.
- .7 Water leakage: none, when measured in accordance with AAMA 501, ASTM E331, AND ASTM E1105.
- .8 Systems to provide for expansion and contraction within system components caused by a cycling temperature range of 95 degrees C over a 12 hour period without causing detrimental affect to system components.
- .9 Drain water entering joints, condensation occurring in glazing channels, or migrating moisture occurring within systems, to the exterior by a weep drainage network.
- .10 Maintain continuous air barrier and vapour retarder throughout assembly, primarily in line with inside pane of glass and heel bead of glazing compound. Position thermal insulation on exterior surface of air barrier and vapour retarder.
- .11 Ensure no vibration harmonics, wind whistles, noises caused by thermal movement, thermal movement transmitted to other building elements, loosening, weakening, or fracturing of attachments or components of system occur.

1.4 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Submit submittals in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Submit product data: Provide component dimensions, describe components within assembly, anchorage and fasteners, glass and infill, internal drainage details and water flow diagrams.
- .3 Submit shop drawings: Indicate system dimensions, framed opening requirements and tolerances, adjacent construction, anchor details anticipated deflection under load, affected related Work, weep drainage network, expansion and contraction joint location and details, and field welding required.
- .4 Submit two samples mm in size illustrating prefinished aluminum surface, finish, colour, texture, specified glass units, glazing materials illustrating edge and corner.

1.5 DELIVERY, STORAGE, AND HANDLING

- .1 Deliver, store, handle and protect materials in accordance with Section 01 60 00.
- .2 Handle work of this section in accordance with AAMA CW-10.
- .3 Protect prefinished aluminum surfaces. Do not use adhesive papers or sprayed coatings which bond when exposed to sunlight or weather.

1.6 ENVIRONMENTAL REQUIREMENTS

- .1 Do not install sealants when ambient and surface temperature is less than 5 degrees C.
- .2 Maintain this minimum temperature during and after installation of sealants.

1.7 SEQUENCING

- .1 Coordinate work of this section with installation of fire stopping, air barrier placement, vapour retarder placement, flashing placement, and components or materials.

1.8 WARRANTY

- .1 For the Work of this Section, the 12 months warranty period prescribed in General Conditions is extended to 24 months.

Part 2 Products

2.1 MATERIALS

- .1 Extruded aluminum: ASTM B221.
- .2 Sheet aluminum: ASTM B209.
- .3 Fasteners: aluminum and stainless steel finish to match adjacent material.

- .4 Bituminous paint: CAN/CGSB 1.108, without thinner.
- .5 Glass units: in accordance with Section 08 80 50.
- .6 Sealant:
 - .1 As recommended by manufacturer.
 - .2 In accordance with Section 07 92 00.

2.2 COMPONENTS

- .1 Mullion profiles, frame profiles and door profiles as indicated on the drawings.
 - .1 Alumicor versa wall 2500 series.
- .2 Flashings: finish as selected, to match curtain wall mullion sections where exposed, secured with concealed fastening method.
- .3 Curtain wall system and door adapter by same manufacturer as aluminum door manufacturer.
- .4 Acceptable material system Curtain Wall: Alumicor 2600 series 5 ¼" thick deep capped ¾" and SSG as indicated.
- .5 Phantom vents with roto operators.
- .6 Interior wall system: Alumicor 3400 series.

2.3 SPANDREL PANELS

- .1 Fabricate panels and seal edge seals around perimeter of panel assembly, enabling installation and minor movement of perimeter seal.
- .2 Accurately fit and secure joints and corners. Make joints flush, hairline, and weatherproof.
- .3 Arrange fasteners and attachments to ensure concealment from view.
- .4 Spandrel panel backs: prefinished colour as determined by Construction Manager.

2.4 FABRICATION

- .1 Fabricate system components with minimum clearances and shim spacing around perimeter of assembly, yet enabling installation and dynamic movement of perimeter seal.
- .2 Accurately fit and secure joints and corners. Make joints flush, hairline, and weatherproof.
- .3 Prepare components to receive anchor devices. Install anchors.
- .4 Arrange fasteners and attachments to ensure concealment from view.
- .5 Prepare system components to receive hardware specified in Section 08 71 00.
- .6 Reinforce framing members for external imposed loads.
- .7 Visible manufacturer's identification labels not permitted.

2.5 FINISHES

- .1 Finish coatings: conform to AA designations - clear anodized
- .2 Exposed aluminum surfaces: AAMA AA A41 class II, anodized to 215-R1, minimum 0.4 mils thickness.
- .3 Touch-up primer for galvanized steel surfaces: SSPC 20 Paint zinc rich.
- .4 Concealed steel items: galvanized in accordance with ASTM A123 to 600 gm/m². Primed with iron oxide paint.
- .5 Apply two coats of bituminous paint to concealed aluminum and steel surfaces in contact with cementitious or dissimilar materials.

2.6 SOURCE QUALITY CONTROL

- .1 Perform work in accordance with AAMA GSM-1, AAMA CW-I-9.
- .2 Manufacturer qualifications: company specializing in manufacturing the products specified in this section with minimum five years documented experience.
- .3 Installer qualifications: company specializing in performing the work of this section with minimum five years documented experience and approved by manufacturer.
- .4 Design structural support framing components to CAN3 S157 under direct supervision of a Professional Structural Engineer experienced in design of this Work and licensed in the Province of Manitoba.
- .5 Perform welding Work in accordance with CSA W59.2.

Part 3

Execution

3.1

EXAMINATION

- .1 Verify dimensions, tolerances, and method of attachment with other work.
- .2 Verify wall openings and adjoining air barrier and vapour retarder materials are ready to receive work of this section.

3.2

INSTALLATION

- .1 Install curtain wall systems in accordance with manufacturer's instructions.
- .2 Attach to structure to permit sufficient adjustment to accommodate construction tolerances and other irregularities.
- .3 Provide alignment attachments and shims to permanently fasten system to building structure. Clean weld surfaces; apply protective primer to field welds and adjacent surfaces.
- .4 Align assembly plumb and level, free of warp or twist. Maintain assembly dimensional tolerances and align with adjacent work.
- .5 Provide thermal isolation where components penetrate or disrupt building insulation.
- .6 Install sill flashings.
- .7 Coordinate installation of fire stop insulation, specified in Section 07 84 00, at each floor slab edge and intersection with vertical construction where indicated.
- .8 Co-ordinate attachment and seal of perimeter air barrier and vapour retarder materials.
- .9 Pack fibrous insulation in shim spaces at perimeter of assembly to maintain continuity of thermal barrier.
- .10 Install associated flashings.
- .11 Install glass in accordance with Section 08 80 50 - Glazing, to glazing method required to achieve performance criteria. Exterior wet/dry method of glazing. Place sealant on the up-slope side of the pressure plate cover caps; finish the surface with a slope to encourage drainage over the cap.
- .12 Install spandrel panels.
- .13 Install vents and operators.
- .14 Install perimeter sealant to method required to achieve performance criteria. Type, backing materials, and installation criteria in accordance with Section 07 92 00 - Joint Sealants.

3.3

SITE TOLERANCES

- .1 Maximum variation from plumb: 1.5 mm/m non-cumulative or 12 mm/30 m, whichever is less.
- .2 Maximum misalignment of two adjoining members abutting in plane: 0.8 mm.
- .3 Maximum sealant space between curtain wall and adjacent construction: 13 mm.

3.4

FIELD QUALITY CONTROL

- .1 Inspection will monitor quality of installation and glazing.
- .2 Test to ASTM E1105, ASTM E1105 and AAMA 501.
- .3 Evaluate installed system by thermo-photographic scan. Provide report to within 3 days.

3.5

MANUFACTURER'S FIELD SERVICES

- .1 Curtain wall / Storefront Glass product manufacturers to provide field surveillance of installation of their Products.
- .2 Monitor and report installation procedures, unacceptable conditions.

3.6

ADJUSTING

- .1 Adjust doors for smooth operation.

99% REVIEW

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- 3.7** **CLEANING**
- .1 Remove protective material from prefinished aluminum surfaces.
 - .2 Wash down surfaces with a solution of mild detergent in warm water, applied with soft, clean wiping cloths. Take care to remove dirt from corners. Wipe surfaces clean.
 - .3 Remove excess sealant by moderate use of mineral spirits or other solvent acceptable to sealant manufacturer.
- 3.8** **PROTECTION**
- .1 Protect finished Work from damage.

END OF SECTION

PART 1 General

1.1 REFERENCES

- .1 Aluminum Association (AA), AA DAF 45-03(R2009), Designation System for Aluminum Finishes.
- .2 American Architectural Manufacturers Association (AAMA).
 - .1 AAMA CW-10-2004, Care and Handling of Architectural Aluminum from Shop to Site.
- .3 Canada Green Building Council (CaGBC).
 - .1 LEED® Canada-NC Version 1.0 - 2004, LEED (Leadership in Energy and Environmental Design): Green Building Rating System Reference Package for New Construction and Major Renovations including Addendum 2007.
- .4 Canadian Standards Association (CSA) International
 - .1 CSA-A440-04/A440.1-04, A440-04 Windows / Special Publication A440.1-04, User Selection Guide to CSA Standard A440-04, Windows.
 - .2 CAN/CSA-Z91-M90 (R2000), Safety Code for Window Cleaning Operations.
 - .3 CAN/CSA-S157-2005, Strength Design in Aluminum.

1.2 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Submit submittals in accordance with Section 01 33 00.
- .2 Product data: Submit product data including manufacturer's literature for aluminum window frames, glazing, components and accessories, indicating compliance with specified requirements and material characteristics.
 - .1 Submit list on window manufacturer's letterhead of materials, components and accessories to be incorporated into Work.
 - .2 Include product names, types and series numbers.
 - .3 Include contact information for manufacturer and their representative for this Project.
- .3 Shop drawings: Indicate materials and details in full size scale for head, jamb and sill, profiles of components, interior and exterior trim, junction between combination units elevations of unit, anchorage details, location of isolation coating, description of related components and exposed finishes fasteners, and caulking. Indicate location of manufacturer's nameplates.
- .4 Samples:
 - .1 Submit duplicate 300 x 300 mm sample sections showing prefinished aluminum surface, finish, colour and texture, and including frame corner details and hardware.
 - .2 Submit duplicate 300 x 300 mm sample sections of insulating glass unit showing glazing materials and edge and corner details.
- .5 Thermal Performance: Submit verification that Insulating Glass Units used meet RSI (R) values specified.
- .6 Sustainable Design LEED: Submittals: In accordance with Section 01 47 15.
- .7 Provide operation and maintenance data for windows for incorporation into manual specified in Section 01 78 00.

1.3 DELIVERY STORAGE AND HANDLING

- .1 Deliver material in accordance with Section 01 61 00 - Common Product Requirements.
 - .1 Deliver aluminum windows in manufacturer's original packaging with identification labels intact and in sizes to suit project.
 - .2 Brace frames to maintain squareness and rigidity during shipment.
- .2 Material Handling: To AAMA CW-10.
- .3 Storage and Handling Requirements: Store materials off ground and protected from exposure to harmful weather conditions and at temperature conditions recommended by manufacturer.
 - .1 Material storage: To AAMA CW-10.

- .4 Packaging Waste Management: remove for reuse and return by manufacturer of pallets, crates, padding, and packaging materials as specified in Construction Waste Management Plan, Waste Reduction Workplan in accordance with Section 01 74 19 - Construction/Demolition Waste Management and Disposal and Section 01 47 15.

1.4 WARRANTY

- .1 Warranty period: 5 years commencing on Date of Substantial Performance of Work.
 - .1 Insulating glass units: 10 years, on Date of Substantial Performance of Work.

PART 2 Products

2.1 DESCRIPTION

- .1 Thermally broken, aluminum framed, fixed, awning windows with double glazed insulating glass units and concealed tamperproof fasteners.
- .1 All aluminum windows by same manufacturer.
- .2 Glass: in accordance with Section 08 80 50.
- .3 Exterior metal sills, aluminum facings: extruded aluminum brake formed aluminum sheet metal of type and size as detailed, to suit job conditions; minimum 3 mm thick, complete with joint covers, jamb drip deflectors, chairs, and anchoring devices.
- .4 Isolation coating: alkali resistant bituminous paint.

2.2 FIXED WINDOW

- .1 Window Classification: To CAN/CSA A440/A440.1.
 - .1 Air tightness: Fixed.
 - .2 Water tightness: B7.
 - .3 Wind load resistance: C5.
 - .4 Condensation resistance: Temperature Index, I=58 minimum.
- .1 Acceptable product: Alumicor featureline 990.

2.3 PROJECT OUT WINDOWS (AWANING)

- .1 Acceptable product: Alumicor Univent 1350 top hung project out vent.
- .2 Hinges: equip each operable window with 1 pair of stainless steel, 4 bar friction arm hinges complete with semi-concealed operating tension adjustment device.
- .3 Operators: Equip each window unit with under screen staybars.
- .4 Locking: Equip each operable window with 2 locking claw handles with plated finish.
- .5 Screens: Screens: To CAN/CGSB-79.1
 - .1 Insect screening mesh: Count 18 x 16 fibreglass.
 - .2 Screen frames: Extruded aluminum secured with turn-clip fasteners and colour to match exterior window frame.
 - .3 Screen mounting: Interior

2.4 FABRICATION

- .1 Fabricate in accordance with CSA-A440/A440.1 supplemented as follows:
- .2 Fabricate aluminum assemblies of extruded sections to sizes and profiles indicated.
- .3 Fabricate each window frame and sash using 2 extruded components joined by thermal break.
- .4 Construct units square, plumb and free from distortion, waves, twists, buckles or other defects detrimental to performance or appearance.
 - .1 Brace frames to maintain squareness and rigidity during shipment and installation.
- .5 Fabricate units square and true with maximum tolerance of plus or minus 1.5 mm for units with a diagonal measurement of 1800 mm or less and plus or minus 3 mm for units with a diagonal measurement over 1800 mm.
- .6 Face dimensions detailed are maximum permissible sizes.

- .7 Use only concealed tamperproof fasteners
 - .1 Where fasteners cannot be concealed, countersunk screws finished to match adjacent material may be used upon receipt of written approval from Consultant.
- .8 Provide pressure equalized sill weep system to ensure water does not accumulate in sill area.
- .9 Visible manufacturer's labels are not permitted.

2.5 ALUMINUM FINISHES

- .1 Exterior exposed aluminum surfaces: To AA DAF-45-M12C22 A44, Architectural, Class I clear anodized 18 µm minimum thickness Clear Anodic finish.
- .2 Interior exposed aluminum surfaces: To AA DAF-45-M12C22 A44, Architectural Class I, anodized 18 µm minimum thickness clear.

2.6 ISOLATION COATING

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

2.7 GLAZING

- .1 Glaze windows in accordance with CSA-A440/A440.1 and Section 08 80 50.

2.8 AIR BARRIER AND VAPOUR RETARDER

- .1 Equip window frames with site installed air barrier and vapour retarder material for sealing to building air barrier and vapour retarder as follows:
 - .1 Material: identical to, or compatible with, building air barrier and vapour retarder materials to provide required air tightness and vapour diffusion control throughout exterior envelope assembly.
 - .2 Material width: adequate to provide required air tightness and vapour diffusion control to building air barrier and vapour retarder from interior.

PART 3 Execution

3.1 WINDOW INSTALLATION

- .1 Install in accordance with CSA-A440/A440.1.
- .2 Arrange components to prevent abrupt variation in colour.

3.2 SILL INSTALLATION

- .1 Install metal sills with uniform wash to exterior, level in length, straight in alignment with plumb upstands and faces. Use one piece lengths at each location.
- .2 Cut sills to fit mm longer than window opening.
- .3 Secure sills in place with anchoring devices located at ends, joints of continuous sills and evenly spaced 600 mm on centre in between.
- .4 Fasten expansion joint cover plates and drip deflectors with self tapping stainless steel screws.
- .5 Maintain 6 to 9 mm space between butt ends of continuous sills. For sills over 1200 mm in length, maintain 3 to 6 mm space at each end.
- .6 Install insect screens.

3.3**CAULKING**

- .1 Seal joints between windows and window sills with sealant. Bed sill expansion joint cover plates and drip deflectors in bedding compound. Caulk between sill upstand and window-frame. Caulk butt joints in continuous sills.
- .2 Apply sealant in accordance with Section 07 92 00 - Joint Sealants. Conceal sealant within window units except where exposed use is permitted by Construction Manager.

END OF SECTION

Part 1**General****1.1****REFERENCES**

- .1 ANSI/BHMA A156.9-10, Cabinet Hardware.
- .2 ANSI/BHMA A156.11-10, Cabinet Locks.
- .3 ANSI/BHMA A156.16-08, Auxiliary Hardware.
- .4 ANSI/BHMA A156.18-06, Materials and Finishes.

1.2**ACTION AND INFORMATIONAL SUBMITTALS**

- .1 Submit submittals in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Product Data: Submit manufacturer's printed product literature, specifications and data sheets.
- .3 Samples: Submit samples.
- .4 Hardware List:
 - .1 Submit contract hardware list.
 - .2 Indicate specified hardware, including make, model, material, function, finish and other pertinent information.
- .5 Manufacturer's Instructions: Submit manufacturer's installation instructions.
- .6 Closeout Submittals: Provide maintenance data, parts list, and manufacturer's instructions for incorporation into maintenance manual specified in Section 01 00 02.

1.3**QUALITY ASSURANCE**

- .1 Pre-installation Meetings: conduct pre-installation meeting to verify project requirements, manufacturer's installation instructions and manufacturer's warranty requirements.

1.4**DELIVERY, STORAGE, AND HANDLING**

- .1 Packing, Shipping, Handling and Unloading:
 - .1 Deliver, store, handle and protect materials in accordance with Section 01 60 00.
 - .2 Package items of hardware including fastenings, separately or in like groups of hardware, label each package as to item definition and location.
- .2 Storage and Protection: Store cabinet hardware in locked, clean and dry area.

Part 2**Products****2.1****HARDWARE ITEMS**

- .1 Use one manufacturer's product for all similar items.

2.2**CABINET HARDWARE AND MISCELLANEOUS HARDWARE**

- .1 Hinges: Blum 110° concealed self-closing with six-way adjustment finish to 26D.
- .2 Pulls reception area : Mfgr: Richelieu No 3487128 stainless steel.
 - .1 Finish: 170 stainless steel.
 - .2 Dimension: 128 mm c.c.
 - .3 Overall dimension: 208 x 35 mm
 - .4 Screw: 8/32
- .3 Pulls all other areas : Mfgr: Richelieu No 33205 stainless steel.
 - .1 Finish: 170 stainless steel.
 - .2 Dimension: 96mm c.c.
 - .3 Overall dimension: 105 x 30 mm
 - .4 Screw: 8/32
- .4 Drawer slides full extension ball bearing.
 - .1 Typical drawers: Richelieu Accuride 3832SC, 18"-20".
 - .2 Pencil drawers: Richelieu Accuride T2006-90, 18"-20".
- .5 Locks for doors and drawers: Mfgr: Richelieu.
 - .1 Model: 5705 Remove-A-Core.

- .2 Lock locations and Keying: Locations and requirements to be confirmed with Owner.
- .6 Adjustable built-in shelving standards and clips for cabinets: KV255 Series, finish nickel.
- .7 Retractable keyboard and mouse tray: Mfgr: Richelieu 5006170C1 – classic combination including mechanism and keyboard tray.
- .8 Cable Grommets: Richelieu cable entry plug 600910, colour to match adjacent plastic laminate Confirm colour with Consultant. Provide quantities as required by owner.
- .9 Wire Management Molding: Mfgr. Richelieu Panel Products PF56-90, colour 40 Almond.
- .10 Metal Closet Rod: 14 Gauge, 1-5/16" Diameter, Chrome Finish, 8' Length, 1 5/16" diameter, chrome finish, Richelieu #122208140.
- .11 Closet Rod Flange: 1-5/16" Diameter, Projection 1", Chrome Finish, Richelieu #1225140
- .12 Piano Hinge: 32 mm wide, 29 3/8" long, .7 mm thickness, #5 screws.
 - .1 Mfgr: Richelieu 322978-180, nickel.
- .13 Metafile : aluminum gallery system for file drawers.
 - .1 Mfgr: Richelieu ZRM550100.
- .14 Stand-off with cap (counterfront) :
 - .1 Mfgr : Mogg Constructive Inc
 - .2 SS050 - Standoff base type T – stainless steel finish, dimensions 25 mm diameter x 12 mm height.
 - .3 SS046 sleeve.
 - .4 SSo41 Gasket.
 - .5 SS051 standoff cap : stainless steel finish.

2.3 FASTENINGS

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

Part 3 Execution

3.1 MANUFACTURER'S INSTRUCTIONS

- .1 Compliance: comply with manufacturer's written data, including product technical bulletins, product catalogue installation instructions, product carton installation instructions, and data sheets.

3.2 INSTALLATION

- .1 Install hardware to standard hardware location dimensions in accordance with manufacturer's recommendations and to project design requirements.
- .2 Install Wire Management Molding typically towards wall of knee space, under worktop.
- .3 Keying to Section 08 71 00.

3.3 ADJUSTING

- .1 Adjust cabinet hardware for optimum, smooth operating condition.
- .2 Lubricate hardware and other moving parts.
- .3 Adjust cabinet door hardware to provide tight fit at contact points with frames.

3.4 CLEANING

- .1 Perform cleaning after installation to remove construction and accumulated environmental dirt.
- .2 Clean hardware with damp rag and approved non-abrasive cleaner, and polish hardware in accordance with manufacture's instructions.
- .3 Remove protective material from hardware items where present.
- .4 Upon completion of installation, remove surplus materials, rubbish, tools and equipment barriers.

3.5

DEMONSTRATION

- .1 Maintenance Staff Briefing.
 - .1 Brief maintenance staff regarding:
 - .1 Proper care, cleaning, and general maintenance of projects complete hardware.
- .2 Demonstrate operation, operating components, adjustment features, and lubrication requirements.

END OF SECTION

Part 1 General

1.1 REFERENCES

- .1 Canadian Steel Door and Frame Manufacturers' Association (CSDFMA).
 - .1 CSDFMA Canadian Metric Guide for Steel Doors and Frames (Modular Construction): standard hardware location dimensions.

1.2 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Submit submittals in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Product Data: Submit manufacturer's printed product literature, specifications and data sheets.
- .3 Samples:
 - .1 Identify each sample by label indicating applicable specification paragraph number, brand name and number, finish and hardware package number.
 - .2 After approval samples will be returned for incorporation in the Work.
 - .3 Submit contract hardware list.
 - .4 Indicate specified hardware, including make, model, material, function, size, finish and other pertinent information.
- .4 Manufacturer's Instructions: Submit manufacturer's installation instructions.
- .5 Closeout Submittals: Provide operation and maintenance data for door closers, locksets, door holders for incorporation into manual specified in Section 01 00 02.

1.3 QUALITY ASSURANCE

- .1 Pre-installation Meetings: conduct pre-installation meeting to verify project requirements, manufacturer's installation instructions and manufacturer's warranty requirements.

1.4 DELIVERY, STORAGE, AND HANDLING

- .1 Packing, Shipping, Handling and Unloading:
 - .1 Deliver, store, handle and protect materials in accordance with Section 01 60 00.
 - .2 Package each item of hardware including fastenings, separately or in like groups of hardware, label each package as to item definition and location.
- .2 Storage and Protection: Store finishing hardware in locked, clean and dry area.

1.5 MAINTENANCE

- .1 Extra Materials:
 - .1 Provide maintenance materials in accordance with Section 01 78 00.
 - .2 Supply two sets of wrenches for door closers, locksets and fire exit hardware.

Part 2 Products

2.1 HARDWARE ITEMS

- .1 Use one manufacturer's products only for similar items.

2.2 DOOR HARDWARE AND SCHEDULE

- .1 As indicated in Schedule.

2.3 MISCELLANEOUS HARDWARE

- .1 Indexed key control system: to CAN/CGSB-69.21, designated by letter E and numeral identifiers, portable system type.

2.4 FASTENINGS

- .1 Use only fasteners provided by manufacturer. Failure to comply may void warranties and applicable licensed labels.

- .2 Supply screws, bolts, expansion shields and other fastening devices required for satisfactory installation and operation of hardware.
- .3 Exposed fastening devices to match finish of hardware.
- .4 Where pull is scheduled on one side of door and push plate on other side, supply fastening devices, and install so pull can be secured through door from reverse side. Install push plate to cover fasteners.
- .5 Use fasteners compatible with material through which they pass.

2.5 KEYING

- .1 Doors, to be keyed as noted in Hardware Schedule and as directed. Prepare detailed keying schedule in conjunction with Consultant.
- .2 Key to master key system.
- .3 Provide three keys for every lock in this Contract.
- .4 Stamp keying code numbers on keys and cylinders.
- .5 Provide construction cores.
- .6 Provide all permanent cores and keys to Construction Manager.

Part 3 Execution

3.1 MANUFACTURER'S INSTRUCTIONS

- .1 Compliance: comply with manufacturer's written data, including product technical bulletins, product catalogue installation instructions, product carton installation instructions, and data sheets.
- .2 Furnish door and frame manufacturers with complete instructions and templates for preparation of their work to receive hardware.
- .3 Furnish manufacturers' instructions for proper installation of each hardware component.

3.2 INSTALLATION

- .1 Install hardware to standard hardware location dimensions in accordance with Canadian Metric Guide for Steel Doors and Frames (Modular Construction) prepared by Canadian Steel Door and Frame Manufacturers' Association.
- .2 Where door stop contacts door pulls, mount stop to strike bottom of pull.
- .3 Provide key control cabinet to Consultant.
- .4 Use only manufacturer's supplied fasteners. Failure to comply may void manufacturer's warranties and applicable licensed labels. Use of "quick" type fasteners, unless specifically supplied by manufacturer, is unacceptable.
- .5 Remove construction cores, locks when directed by Construction Manager; install permanent cores and check operation of locks.

3.3 ADJUSTING

- .1 Adjust door hardware, operators, closures and controls for optimum, smooth operating condition, safety and for weather tight closure.
- .2 Lubricate hardware, operating equipment and other moving parts.
- .3 Adjust door hardware to provide tight fit at contact points with frames.

3.4 CLEANING

- .1 Perform cleaning after installation to remove construction and accumulated environmental dirt.
- .2 Clean hardware with damp rag and approved non-abrasive cleaner, and polish hardware in accordance with manufacture's instructions.
- .3 Remove protective material from hardware items where present.
- .4 Upon completion of installation, remove surplus materials, rubbish, tools and equipment barriers.

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3.5 DEMONSTRATION

- .1 Keying System Setup and Cabinet:
 - .1 Set up key control system with file key tags, duplicate key tags, numerical index, alphabetical index and key change index, label shields, control book and key receipt cards.
 - .2 Place file keys and duplicate keys in key cabinet on their respective hooks.
 - .3 Lock key cabinet and turn over key to Construction Manager.
- .2 Maintenance Staff Briefing:
 - .1 Brief maintenance staff regarding:
 - .1 Proper care, cleaning, and general maintenance of projects complete hardware.
 - .2 Description, use, handling, and storage of keys.
 - .3 Use, application and storage of wrenches for door closers, locksets and fire exit hardware.
- .3 Demonstrate operation, operating components, adjustment features, and lubrication requirements.

HW SET: 01

4	EA	HINGE	3CB1 4.5 X 4 NRP	630	IVE
1	EA	PANIC HARDWARE	CD35A-NL-OP GBK	626	VON
1	EA	MORTISE CYLINDER	20-001	626	SCH
1	EA	RIM CYLINDER	20-021	626	SCH
1	EA	OFFSET DOOR PULL	8190-2	630	IVE
1	EA	AUTO. OPERATOR	9542 REG	628	LCN
1	EA	THRESHOLD	CT-10	627	KNC
			WEATHERSTRIP & SWEEP BY DOOR SUPPLIER		
1	EA	GUARDRAIL	GUARDRAIL TO MEET MANITOBA CODE	627	
1	EA	SAFETY SENSOR	8310-804-2		LCN
1	EA	ROCKER SWITCH	8310-806R		LCN
4	EA	ACTUATOR, JAMB	8310-818		LCN
		MOUNT			
1	EA	HARNESS	8310-847		LCN

NOTE: ACTUATORS TO BE MOUNTED AT HAND AND FOOT LEVEL ON BOTH SIDES OF DOOR.

HW SET: 02

4	EA	HINGE	3CB1 4.5 X 4	652	IVE
1	EA	PANIC HARDWARE	CD35A-NL-OP GBK	626	VON
1	EA	MORTISE CYLINDER	20-001	626	SCH
1	EA	RIM CYLINDER	20-021	626	SCH
1	EA	ELECTRIC STRIKE	6111 FSE X SHIM	630	VON
1	EA	OFFSET DOOR PULL	8190-2	630	IVE
1	EA	AUTO. OPERATOR	9542 REG	628	LCN
1	EA	ROCKER SWITCH	8310-806R		LCN
4	EA	ACTUATOR, JAMB	8310-818		LCN
		MOUNT			
1	EA	RX SENSOR	RX SENSOR BY OTHERS		
1			CARD READER BY OTHERS		

HW SET: 03

3	EA	HINGE	3CB1 4.5 X 4	652	IVE
1	EA	STOREROOM LOCK	AL80PD SAT	626	SCH
1	EA	ELECTRIC STRIKE	6211 FSE	630	VON
1	EA	SURFACE CLOSER	1461	689	LCN
1	EA	KICK PLATE	8400 10"	630	IVE

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1	EA	DOME STOP	FS438	626	IVE
1	EA	RX SENSOR	RX SENSOR BY OTHERS		
1			CARD READER BY OTHERS		
HW SET: 04					
3	EA	HINGE	3CB1 4.5 X 4	652	IVE
1	EA	PRIVACY SET	AL40S SAT	626	SCH
1	EA	SURFACE CLOSER	1461	689	LCN
1	EA	KICK PLATE	8400 10"	630	IVE
1	EA	WALL STOP	WS406CCV	630	IVE
HW SET: 05					
3	EA	HINGE	3CB1 4.5 X 4 NRP	652	IVE
1	EA	STOREROOM LOCK	AL80PD SAT	626	SCH
1	EA	SURFACE CLOSER	1461 CUSH	689	LCN
1	EA	KICK PLATE	8400 10"	630	IVE
HW SET: 06					
3	EA	HINGE	3CB1 4.5 X 4 NRP	652	IVE
1	EA	PANIC HARDWARE	98L 996L	626	VON
1	EA	RIM CYLINDER	20-021	626	SCH
1	EA	SURFACE CLOSER	4040XP HEDA	689	LCN
1	EA	KICK PLATE	8400 10"	630	IVE
1	EA	WALL STOP	WS406CVX	630	IVE
HW SET: 07					
3	EA	HINGE	3CB1 4.5 X 4	652	IVE
1	EA	STOREROOM LOCK	ND80PD RHO	626	SCH
1	EA	ELECTRIC STRIKE	6211 FSE	630	VON
1	EA	SURFACE CLOSER	4040XP	689	LCN
1	EA	KICK PLATE	8400 10"	630	IVE
1	EA	WALL STOP	WS406CVX	630	IVE
1	EA	RX SENSOR	RX SENSOR BY OTHERS		
1			CARD READER BY OTHERS		
HW SET: 08					
3	EA	HINGE	3CB1 4.5 X 4 NRP	652	IVE
1	EA	STOREROOM LOCK	ND80PD RHO	626	SCH
1	EA	ELECTRIC STRIKE	6211 FSE	630	VON
1	EA	SURFACE CLOSER	4040XP EDA	689	LCN
1	EA	KICK PLATE	8400 10"	630	IVE
1	EA	WALL STOP	WS406CVX	630	IVE
1	EA	RX SENSOR	RX SENSOR BY OTHERS		
1			CARD READER BY OTHERS		
HW SET: 09					
3	EA	HINGE	3CB1 4.5 X 4	652	IVE
1	EA	STOREROOM LOCK	AL80PD SAT	626	SCH
1	EA	SURFACE CLOSER	1461	689	LCN
1	EA	KICK PLATE	8400 10"	630	IVE
1	EA	DOME STOP	FS438	626	IVE
HW SET: 10					
4	EA	HINGE	3CB1 4.5 X 4	652	IVE
1	EA	FIRE EXIT HARDWARE	98L-BE-F 996L-BE	626	VON
1	EA	SURFACE CLOSER	4040XP	689	LCN

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1	EA	KICK PLATE	8400 10"	630	IVE
1	EA	WALL STOP	WS406CVX	630	IVE
1	SET	WEATHERSTRIP	W-21	BLK	KNC
1	EA	DOOR BOTTOM	CT-50	628	KNC
HW SET: 11					
4	EA	HINGE	3CB1 4.5 X 4 NRP	630	IVE
1	EA	PANIC HARDWARE	98EO	626	VON
1	EA	ASTRAGAL	W-7	PRI	KNC
1	EA	SURFACE CLOSER	4040XP EDA	689	LCN
1	EA	OVERHEAD STOP	100S	630	GLY
1	EA	KICK PLATE	8400 10"	630	IVE
1	EA	WEATHERSTRIP	W-20S HEAD ONLY	628	KNC
2	EA	WEATHERSTRIP	W-50 JAMBS ONLY	628	KNC
1	EA	DOOR SWEEP	W-24S	628	KNC
1	EA	THRESHOLD	CT-10	627	KNC
HW SET: 12					
4	EA	HINGE	3CB1 4.5 X 4	652	IVE
1	EA	PASSAGE SET	AL10S SAT	626	SCH
1	EA	SURFACE CLOSER	4040XP	689	LCN
1	EA	KICK PLATE	8400 10"	630	IVE
1	EA	DOME STOP	FS438	626	IVE
HW SET: 13					
4	EA	HINGE	3CB1 4.5 X 4 NRP	652	IVE
1	EA	STOREROOM LOCK	ND80PD RHO	626	SCH
1	EA	ELECTRIC STRIKE	6211 FSE	630	VON
1	EA	SURFACE CLOSER	4040XP	689	LCN
1	EA	OVERHEAD STOP	900S	630	GLY
1	EA	KICK PLATE	8400 10"	630	IVE
1	EA	RX SENSOR	RX SENSOR BY OTHERS		
1			CARD READER BY OTHERS		
HW SET: 14					
3	EA	HINGE	3CB1 4.5 X 4	652	IVE
1	EA	ENTRANCE LOCK	AL53PD SAT	626	SCH
1	EA	DOME STOP	FS438	626	IVE
HW SET: 15					
3	EA	HINGE	3CB1 4.5 X 4	652	IVE
1	EA	STOREROOM LOCK	AL80PD SAT	626	SCH
1	EA	SURFACE CLOSER	1461	689	LCN
1	EA	KICK PLATE	8400 10"	630	IVE
1	EA	DOME STOP	FS438	626	IVE
1	SET	WEATHERSTRIP	W-21	BLK	KNC
1	EA	DOOR BOTTOM	CT-50	628	KNC
HW SET: 16					
3	EA	HINGE	3CB1 4.5 X 4	652	IVE
1	EA	PASSAGE SET	AL10S SAT	626	SCH
1	EA	SURFACE CLOSER	1461	689	LCN
1	EA	OVERHEAD STOP	450S	652	GLY
1	EA	KICK PLATE	8400 10"	630	IVE

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HW SET: 17

4	EA	HINGE	3CB1 4.5 X 4 NRP	630	IVE
1	EA	PANIC HARDWARE	35A-L GBK	626	VON
1	EA	RIM CYLINDER	20-021	626	SCH
1	EA	SURFACE CLOSER	4021	689	LCN
1	EA	DROP PLATE	4020-18G	689	LCN
1	EA	OVERHEAD STOP	100S	630	GLY
1	EA	THRESHOLD	CT-10	627	KNC
			WEATHERSTRIP & SWEEP BY DOOR SUPPLIER		

HW SET: 18

4	EA	HINGE	3CB1 4.5 X 4	652	IVE
1	EA	PANIC HARDWARE	CD35A-NL-OP GBK	626	VON
1	EA	ELECTRIC STRIKE	6111 FSE X SHIM	630	VON
1	EA	OFFSET DOOR PULL	8190-2	630	IVE
1	EA	SURFACE CLOSER	4021	689	LCN
1	EA	DROP PLATE	4020-18G	689	LCN
1	EA	OVERHEAD STOP	100S	630	GLY
1	EA	RX SENSOR	RX SENSOR BY OTHERS		
1			CARD READER BY OTHERS		

HW SET: 19

3	EA	HINGE	3CB1 4.5 X 4 NRP	652	IVE
1	EA	CLASSROOM LOCK	ND70PD RHO	626	SCH
1	EA	SURFACE CLOSER	4040XP HEDA	689	LCN
1	EA	KICK PLATE	8400 8"	630	IVE
1	EA	DOME STOP	FS438	626	IVE

HW SET: 20

6	EA	HINGE	3CB1 4.5 X 4 NRP	652	IVE
2	EA	MANUAL FLUSH BOLT	FB458	626	IVE
1	EA	CLASSROOM LOCK	ND70PD RHO	626	SCH
1	EA	ASTRAGAL	ASTRAGAL BY DOOR SUPPLIER		
1	EA	SURFACE CLOSER	4040XP HEDA	689	LCN
2	EA	KICK PLATE	8400 8"	630	IVE
2	EA	DOME STOP	FS438	626	IVE

HW SET: 21

3	EA	HINGE	3CB1 4.5 X 4 NRP	652	IVE
1	EA	STOREROOM LOCK	ND80PD RHO	626	SCH
1	EA	ELECTRIC STRIKE	6211 FSE	630	VON
1	EA	SURFACE CLOSER	4040XP	689	LCN
1	EA	KICK PLATE	8400 8"	630	IVE
1	EA	DOME STOP	FS438	626	IVE
1	EA	RX SENSOR	RX SENSOR BY OTHERS		
1			CARD READER BY OTHERS		

HW SET: 22

3	EA	HINGE	3CB1 4.5 X 4 NRP	652	IVE
1	EA	STOREROOM LOCK	ND80PD RHO	626	SCH
1	EA	ELECTRIC STRIKE	6211 FSE	630	VON
1	EA	SURFACE CLOSER	4040XP	689	LCN
1	EA	OVERHEAD STOP	900S	630	GLY
1	EA	KICK PLATE	8400 8"	630	IVE
1	EA	RX SENSOR	RX SENSOR BY OTHERS		
1			CARD READER BY OTHERS		

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HW SET: 23

HARDWARE BY MILLWORK DIVISION

HW SET: 24

3	EA	HINGE	3CB1 4.5 X 4	652	IVE
1	EA	STOREROOM LOCK	AL80PD SAT	626	SCH
1	EA	DOME STOP	FS438	626	IVE

HW SET: 25

3	EA	HINGE	3CB1 4.5 X 4	652	IVE
1	EA	STOREROOM LOCK	AL80PD SAT	626	SCH
1	EA	ELECTRIC STRIKE	6211 FSE	630	VON
1	EA	SURFACE CLOSER	1461	689	LCN
1	EA	OVERHEAD STOP	450S	652	GLY
1	EA	KICK PLATE	8400 10"	630	IVE
1	EA	RX SENSOR	RX SENSOR BY OTHERS		
1			CARD READER BY OTHERS		

HW SET: 26

3	EA	HINGE	3CB1 4.5 X 4 NRP	630	IVE
1	EA	STOREROOM LOCK	ND80PD RHO	626	SCH
1	EA	ELECTRIC STRIKE	6211 FSE	630	VON
1	EA	SURFACE CLOSER	4040XP SCUSH	689	LCN
1	EA	KICK PLATE	8400 10"	630	IVE
1	EA	WEATHERSTRIP	W-20S HEAD ONLY	628	KNC
2	EA	WEATHERSTRIP	W-50 JAMBS ONLY	628	KNC
1	EA	DOOR SWEEP	W-24S	628	KNC
1	EA	THRESHOLD	CT-10	627	KNC
1	EA	LOCK GUARD	LG14	630	IVE
1	EA	RX SENSOR	RX SENSOR BY OTHERS		
1			CARD READER BY OTHERS		

HW SET: 27

3	EA	HINGE	3CB1 4.5 X 4 NRP	652	IVE
1	EA	STOREROOM LOCK	AL80PD SAT	626	SCH
1	EA	ELECTRIC STRIKE	6211 FSE	630	VON
1	EA	SURFACE CLOSER	4040XP HEDA	689	LCN
1	EA	KICK PLATE	8400 10"	630	IVE
1	EA	DOME STOP	FS438	626	IVE
1	EA	RX SENSOR	RX SENSOR BY OTHERS		
1			CARD READER BY OTHERS		

HW SET: 28

3	EA	HINGE	3CB1 4.5 X 4	652	IVE
1	EA	FIRE EXIT HARDWARE	98L-BE-F 996L-BE	626	VON
1	EA	ELECTRIC STRIKE	6111 FSE	630	VON
1	EA	AUTO. OPERATOR	9542 REG	628	LCN
1	EA	DOME STOP	FS438	626	IVE
1	SET	WEATHERSTRIP	W-21	BLK	KNC
1	EA	DOOR BOTTOM	CT-50	628	KNC
1	EA	ROCKER SWITCH	8310-806R		LCN
4	EA	ACTUATOR, WALL MOUNT	8310-852		LCN

NOTE: ACTUATORS TO BE MOUNTED AT HAND AND FOOT LEVEL ON BOTH SIDES OF DOOR.

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HW SET: 29

3	EA	HINGE	3CB1 4.5 X 4 NRP	630	IVE
1	EA	PANIC HARDWARE	98EO	626	VON
1	EA	SURFACE CLOSER	4040XP EDA	689	LCN
1	EA	OVERHEAD STOP	100S	630	GLY
1	EA	KICK PLATE	8400 10"	630	IVE
1	EA	WEATHERSTRIP	W-20S HEAD ONLY	628	KNC
2	EA	WEATHERSTRIP	W-50 JAMBS ONLY	628	KNC
1	EA	DOOR SWEEP	W-24S	628	KNC
1	EA	THRESHOLD	CT-10	627	KNC

HW SET: 30

6	EA	HINGE	3CB1 4.5 X 4	652	IVE
2	EA	MANUAL FLUSH BOLT	FB458	626	IVE
1	EA	CLASSROOM LOCK	AL70PD SAT	626	SCH
1	EA	ASTRAGAL	ASTRAGAL BY DOOR SUPPLIER		
2	EA	KICK PLATE	8400 10"	630	IVE
2	EA	DOME STOP	FS438	626	IVE

HW SET: 31

6	EA	HINGE	3CB1 4.5 X 4 NRP	652	IVE
2	EA	MANUAL FLUSH BOLT	FB458	626	IVE
1	EA	DEADBOLT	B562P	626	SCH
1	EA	PASSAGE SET	AL10S SAT	626	SCH
1	EA	ASTRAGAL	ASTRAGAL BY DOOR SUPPLIER		
2	EA	KICK PLATE	8400 10"	630	IVE
2	EA	DOME STOP	FS438	626	IVE

HW SET: 32

6	EA	HINGE	3CB1 4.5 X 4	652	IVE
2	EA	MANUAL FLUSH BOLT	FB458	626	IVE
1	EA	PASSAGE SET	AL10S SAT	626	SCH
1	EA	ASTRAGAL	ASTRAGAL BY DOOR SUPPLIER		
1	EA	SURFACE CLOSER	4040XP CUSH	689	LCN
2	EA	KICK PLATE	8400 10"	630	IVE
1	EA	DOME STOP	FS438	626	IVE

HW SET: 33

3	EA	HINGE	3CB1 4.5 X 4 NRP	630	IVE
1	EA	STOREROOM LOCK	ND80PD RHO	626	SCH
1	EA	SURFACE CLOSER	4040XP SCUSH	689	LCN
1	EA	KICK PLATE	8400 10"	630	IVE
1	EA	WEATHERSTRIP	W-20S HEAD ONLY	628	KNC
2	EA	WEATHERSTRIP	W-50 JAMBS ONLY	628	KNC
1	EA	DOOR SWEEP	W-24S	628	KNC
1	EA	THRESHOLD	CT-10	627	KNC
1	EA	LOCK GUARD	LG10	630	IVE

HW SET: 34

3	EA	HINGE	3CB1 4.5 X 4 NRP	652	IVE
1	EA	STOREROOM LOCK	ND80PD RHO	626	SCH
1	EA	ELECTRIC STRIKE	6211 FSE	630	VON
1	EA	SURFACE CLOSER	4040XP	689	LCN
1	EA	KICK PLATE	8400 10"	630	IVE
1	EA	DOME STOP	FS438	626	IVE

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1	EA	RX SENSOR	RX SENSOR BY OTHERS
1			CARD READER BY OTHERS

HW SET: 35

1	EA	SIDE MOUNT TRACK	C-108		
2	EA	HANGER	C-911		KNC
1	EA	DOOR PULL	8102-6	630	IVE
2	EA	DOOR STOP	C-100-HD		KNC
1	EA	GUIDE	C-913		KNC
1	EA	GUIDE CHANNEL	C-914		KNC

HW SET: 36

3	EA	HINGE	3CB1 4.5 X 4		652 IVE
1	EA	PASSAGE SET	AL10S SAT	626	SCH
1	EA	SURFACE CLOSER	4040XP CUSH	689	LCN
1	EA	KICK PLATE	8400 10"	630	IVE

HW SET: 37

3	EA	HINGE	3CB1 4.5 X 4 NRP		652 IVE
1	EA	STOREROOM LOCK	AL80PD SAT	626	SCH
1	EA	ELECTRIC STRIKE	6211 FSE	630	VON
1	EA	SURFACE CLOSER	4040XP CUSH	689	LCN
1	EA	KICK PLATE	8400 10"	630	IVE
1	EA	RX SENSOR	RX SENSOR BY OTHERS		
1			CARD READER BY OTHERS		

HW SET: 38

4	EA	HINGE	3CB1 4.5 X 4 NRP		630 IVE
1	EA	DEADLATCH	4900	628	ADA
1	EA	MORTISE CYLINDER	20-013	626	SCH
1	EA	PADDLE	4590	628	ADA
1	EA	SURFACE CLOSER	4021	689	LCN
1	EA	DROP PLATE	4020-18G	689	LCN
1	EA	OVERHEAD STOP	100S	630	GLY
1	EA	THRESHOLD	CT-10	627	KNC
			WEATHERSTRIP & SWEEP BY DOOR SUPPLIER		

HW SET: 39

4	EA	HINGE	3CB1 4.5 X 4		652 IVE
1	EA	STOREROOM LOCK	AL80PD SAT	626	SCH
1	EA	SURFACE CLOSER	1461	689	LCN
1	EA	KICK PLATE	8400 10"	630	IVE
1	EA	WALL STOP	WS406CCV	630	IVE

HW SET: 40

4	EA	HINGE	3CB1 4.5 X 4		652 IVE
1	EA	PULL/PUSHBAR	9190-2	630	IVE
1	EA	SURFACE CLOSER	4021	689	LCN
1	EA	DROP PLATE	4020-18G	689	LCN
1	EA	DOME STOP	FS438	626	IVE

HW SET: 41

3	EA	HINGE	3CB1 4.5 X 4		652 IVE
1	EA	CLASSROOM LOCK	AL70PD SAT	626	SCH
1	EA	DOME STOP	FS438	626	IVE

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HW SET: 42

3	EA	HINGE	3CB1 4.5 X 4	652	IVE
1	EA	PASSAGE SET	AL10S SAT	626	SCH
1	EA	OVERHEAD STOP	450S	652	GLY

HW SET: 43

4	EA	HINGE	3CB1 4.5 X 4	652	IVE
1	EA	FIRE EXIT HARDWARE	98L-BE-F 996L-BE	626	VON
1	EA	SURFACE CLOSER	4040XP	689	LCN
1	EA	KICK PLATE	8400 10"	630	IVE
1	EA	MAGNETIC HOLD- OPEN	SEM 7850	AL	LCN
1	SET	WEATHERSTRIP	W-21	BLK	KNC
1	EA	DOOR BOTTOM	CT-50	628	KNC

NOTE: MAGNETIC HOLDER TO BE CONNECTED TO FIRE ALARM SYSTEM. MAGNET TO RELEASE ON FIRE ALARM.

HW SET: 44

3	EA	HINGE	3CB1 4.5 X 4	652	IVE
1	EA	PUSH PLATE	8200 4" X 16"	630	IVE
1	EA	PULL PLATE	8305-8 4" X 16"	630	IVE
1	EA	SURFACE CLOSER	4040XP EDA	689	LCN
1	EA	KICK PLATE	8400 10"	630	IVE
1	EA	WALL STOP	WS406CVX	630	IVE

HW SET: 45

3	EA	HINGE	3CB1 4.5 X 4 NRP	652	IVE
1	EA	STOREROOM LOCK	AL80PD SAT	626	SCH
1	EA	SURFACE CLOSER	4040XP EDA	689	LCN
1	EA	KICK PLATE	8400 10"	630	IVE
1	EA	DOME STOP	FS438	626	IVE

HW SET: 46

4	EA	HINGE	3CB1 4.5 X 4 NRP	630	IVE
1	EA	DEADBOLT	B560P	626	SCH
1	SET	OFFSET DOOR PULL	8190-2-M	630	IVE
1	EA	SURFACE CLOSER	4040XP SCUSH	689	LCN
1	EA	KICK PLATE	8400 10"	630	IVE
1	EA	WEATHERSTRIP	W-20S HEAD ONLY	628	KNC
2	EA	WEATHERSTRIP	W-50 JAMBS ONLY	628	KNC
1	EA	DOOR SWEEP	W-24S	628	KNC
1	EA	THRESHOLD	CT-10	627	KNC
1	EA	LOCK GUARD	LG10	630	IVE

HW SET: 47

3	EA	HINGE	3CB1 4.5 X 4 NRP	652	IVE
1	EA	STOREROOM LOCK	AL80PD SAT	626	SCH
1	EA	SURFACE CLOSER	4040XP CUSH	689	LCN
1	EA	KICK PLATE	8400 10"	630	IVE
1	SET	WEATHERSTRIP	W-21	BLK	KNC
1	EA	DOOR BOTTOM	CT-50	628	KNC

HW SET: 48

6	EA	HINGE	3CB1 4.5 X 4 NRP	652	IVE
2	EA	MANUAL FLUSH BOLT	FB458	626	IVE

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1	EA	STOREROOM LOCK	AL80PD SAT	626	SCH
1	EA	ASTRAGAL	ASTRAGAL BY DOOR SUPPLIER		
1	EA	SURFACE CLOSER	4040XP CUSH	689	LCN
2	EA	KICK PLATE	8400 10"	630	IVE
1	EA	DOME STOP	FS438	626	IVE
HW SET: 49					
3	EA	HINGE	3CB1 4.5 X 4	652	IVE
1	EA	PASSAGE SET	AL10S SAT	626	SCH
1	EA	SURFACE CLOSER	4040XP	689	LCN
1	EA	KICK PLATE	8400 10"	630	IVE
1	EA	DOME STOP	FS438	626	IVE
1	SET	WEATHERSTRIP	W-21	BLK	KNC
1	EA	DOOR BOTTOM	CT-50	628	KNC
HW SET: 50					
3	EA	HINGE	3CB1 4.5 X 4	652	IVE
1	EA	PASSAGE SET	AL10S SAT	626	SCH
1	EA	SURFACE CLOSER	4040XP HEDA	689	LCN
1	EA	KICK PLATE	8400 10"	630	IVE
1	EA	DOME STOP	FS438	626	IVE
HW SET: 51					
6	EA	HINGE	3CB1 4.5 X 4	652	IVE
2	EA	MANUAL FLUSH BOLT	FB458	626	IVE
1	EA	STOREROOM LOCK	AL80PD SAT	626	SCH
1	EA	ASTRAGAL	ASTRAGAL BY DOOR SUPPLIER		
2	EA	KICK PLATE	8400 10"	630	IVE
2	EA	DOME STOP	FS438	626	IVE
1	SET	WEATHERSTRIP	W-50	628	KNC
2	EA	DOOR SWEEP	W-24S	628	KNC
1	EA	THRESHOLD	CT-10	627	KNC
HW SET: 52					
3	EA	HINGE	3CB1 4.5 X 4	652	IVE
1	EA	CLASSROOM LOCK	AL70PD SAT	626	SCH
1	EA	SURFACE CLOSER	4040XP H	689	LCN
1	EA	KICK PLATE	8400 10"	630	IVE
1	EA	DOME STOP	FS438	626	IVE
HW SET: 53					
4	EA	HINGE	3CB1 4.5 X 4	652	IVE
1	EA	FIRE EXIT HARDWARE	98L-BE-F 996L-BE	626	VON
1	EA	SURFACE CLOSER	4040XP	689	LCN
1	EA	KICK PLATE	8400 10"	630	IVE
1	SET	WEATHERSTRIP	W-21	BLK	KNC
1	EA	DOOR BOTTOM	CT-50	628	KNC
HW SET: 54					
3	EA	HINGE	3CB1 4.5 X 4	652	IVE
1	EA	PASSAGE SET	AL10S SAT	626	SCH
1	EA	SURFACE CLOSER	4040XP EDA	689	LCN
1	EA	KICK PLATE	8400 10"	630	IVE
1	EA	DOME STOP	FS438	626	IVE

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HW SET: 55

6	EA	HINGE	3CB1 4.5 X 4 NRP	652	IVE
2	EA	SURFACE BOLT	SB453-12-TB	652	IVE
1	EA	DEADBOLT	B561P	626	SCH
1	EA	PASSAGE SET	A10S ORB	626	SCH
1	EA	SECURITY BAR	EXIT SECURITY BAR SB-03-UV72		MIS
1	EA	SIGN	WARNING SIGN - SEE REMARKS		MIS

NOTE: DEADBOLT CYLINDER TO BE ON PUSH SIDE OF DOOR.

DISPOSE OF SIGN THAT IS INCLUDED WITH THE SECURITY BAR, AND REPLACE WITH A LAMACOID SIGN READING AS FOLLOWS: "WARNING - DEADFALL OTHER SIDE. USE CAUTION WHEN OPENING DOORS". SIGN TO BE ON PULL SIDE OF DOORS.

END OF SECTION

Part 1 General

1.1 REFERENCES

- .1 ANSI/ASTM E330- 02(2010), Test Method for Structural Performance of Exterior Windows, Doors, Skylights and Curtain Walls by Uniform Static Air Pressure Difference.
- .2 Canadian General Standards Board (CGSB).
 - .1 CAN/CGSB-12.1-M90, Tempered or Laminated Safety Glass.
 - .2 CAN/CGSB-12.3-M91, Flat, Clear Float Glass.
 - .3 CAN/CGSB-12.8-M90 Insulating Glass Units.
 - .4 CAN/CGSB-12.11-M90 Wired Safety Glass.
 - .5 Laminators Safety Glass Association Standards Manual.
- .3 Glass Association of North America (GANA).
 - .1 GANA Glazing Manual 2008.

1.2 SYSTEM DESCRIPTION

- .1 Performance Requirements:
 - .1 Provide continuity of building enclosure vapour and air barrier using glass and glazing materials as follow:
 - .1 Utilize inner light of multiple light sealed units for continuity of air and vapour seal.
 - .2 Size glass to withstand wind loads, dead loads and positive and negative live loads in accordance with ASTM E 300.

1.3 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Submit submittals in accordance with Section 01 33 00.
- .2 Product Data: Submit manufacturer's printed product literature, specifications and data sheet.
- .3 Shop Drawings: Submit shop drawings.
- .4 Manufacturer's Instructions: Submit manufacturer's installation instructions.
- .5 Samples: submit two samples 12" x 12" (300 x 300 mm) in size for each type of glass.
- .6 Closeout Submittals: Provide Warranty Certificates and maintenance data including cleaning instructions for incorporation into manual.

1.4 QUALITY ASSURANCE

- .1 Installer Qualifications: Company specializing in performing the work of this section with a minimum 5 years documented experience.

1.5 WARRANTY

- .1 Provide a ten year warranty to include coverage for sealed glass unity from seal failure, interpane dusting or misting, and replacement of same.
- .2 Provide ten year warranty to include coverage for delamination of laminated glass and replacement of same.

Part 2 Products

2.1 MATERIALS: FLAT GLASS

- .1 IGU 1 Float glass: to CAN/CGSB-12.3, transparent, 6 mm minimum thickness.
- .2 IGU 2 Safety glass: to CAN/CGSB-12.1, clear, Type 2 fully tempered, 6 mm minimum thickness.
- .3 IGU 3 Wired glass: to CAN/CGSB-12.11, Type 1-Polished both sides transparent; Wire mesh style 3-Square mesh of woven stainless steel wire of 12 mm grid size; 6 mm thick.

2.2 MATERIALS: SEALED INSULATING EXTERIOR WINDOWS

- .1 Glaze windows in accordance with CSA-A440-04 and CAN/CGSB-12.8-97, Insulating Glass Units, supplemented as follows:
 - .1 Sealed units to be IGMAC certified. Permanently indicate Manufacturers name, IGMAC number and date of manufacture in corner of sealed unit.
- .2 Glazing Performance:
 - .1 U value: U: .30
 - .2 R value: 0.30
- .3 All tinted or colour glass units or glass units in partial sun and subject to uneven heating to be heat strengthened or tempered as required to maintain specified warranty.
- .4 Edge seal construction: low conductance black stainless steel warm edge spacer.

2.3 EGU 1 INSULATING EXTERIOR ALUMINUM WINDOWS

- .1 Insulating glass units: 25 mm overall thickness with outer pane of 6 mm clear glass 12 mm, air space; 6 mm inner pane of clear glass.
- .2 Aron filled with low E coating on surface 3.

2.4 EGU 2 INSULATING GLASS UNITS (CURTAIN WALL)

- .1 Non-reflecting glass to CAN/CGSB-12.8, double unit, 30 mm overall thickness.
 - .1 With outer pane of 10 mm tempered glass; 12 mm air space; 6 mm inter pane of clear tempered glass.
- .2 Aron filled with low E coating on surface 3.

2.5 EGU 3 INSULATING GLASS UNITS (CURTAIN WALL)

- .1 Non-reflecting glass to CAN/CGSB-12.8, double unit, 30 mm overall thickness.
 - .1 with outer pane of 10 mm tempered glass; 12 mm air space; 6 mm inter pane of clear glass.
- .2 Aron filled with low E coating on surface 3.

2.6 EGU 4 INSULATING GLASS UNITS (OVERHEAD DOORS)

- .1 Insulating glass units: to CAN/CGSB-12.8, double unit, 25 mm overeall thickness with outer and inner pane of 6 mm clear tempered glass. Thermal spacer between panes; air space.
- .2 Aron filled with low E coating on surface 3.

2.7 EGU 5 MATERIALS INSULATING GLASS UNITS (HOLLOW METAL DOORS)

- .1 Insulating glass units: to CAN/CGSB-12.8, double unit, 25 mm overeall thickness with outer and inner pane of 6 mm clear tempered glass. Thermal spacer between panes; air space.
- .2 Aron filled with low E coating on surface 3.

2.8 EGU 6 INSULATING GLASS UNITS (ALUMINUM DOOR)

- .1 Insulating glass units (Aluminum Door): Non-reflecting glass to CAN/CGSB-12.8, double unit, tempered, 25 mm overall thickness.
 - .1 Exterior and interior light: 6.0 mm fully tempered float glasslow emissivity coating on surface 3, and 13 mm air space with edge spacer.

2.9 EGU 7 INSULATING GLASS UNITS (CURTAIN WALL)

- .1 Non-reflecting glass to CAN/CGSB-12.8, double unit, 30 mm overall thickness.
 - .1 With outer pane of 6 mm PPG OPAC 1300, RAL 5019 – Color TBA; 12 mm air space;
 - 6 mm inter pane of float glass.
- .2 Aron filled with low E coating on surface 3.

2.10 EGU 8 INSULATING EXTERIOR ALUMINUM WINDOWS

- .1 Insulating glass units: 25 mm overall thickness with outer pane of 5 mm PPG Stippolite, 13 mm air space; 6 mm inner pane of clear glass.
- .2 Aron filled with low E coating on surface 3.
- .3 Schedule Rooms: 109B, 110B, 136B, 136C, 137, 172, 173, 174 and 175.

2.11 SPANDREL PANELS

- .1 Outer pane of 6 mm PPG OPACI 300, RAL 5019 capri blue.

2.12 ACCESSORIES

- .1 Setting blocks: Neoprene, 80-90 Shore A durometer hardness to ASTM D2240, length of 25 mm for each square meter of glazing, minimum 100 mm x width of glazing rabbet space minus 1.5 mm x height, to suit glazing method, glass light weight and area.
- .2 Spacer shims: Neoprene, 50-60 Shore A durometer hardness to ASTM D2240, 75 mm long x one half height of glazing stop x thickness to suit application.
- .3 Glazing tape: Preformed butyl compound with integral resilient tube spacing device; 10-15 Shore A durometer hardness to ASTM D2240; coiled on release paper; size to suit application; black colour.
- .4 Glazing splines, Gaskets: manufacturer's standard.

Part 3 Execution

3.1 MANUFACTURER'S INSTRUCTIONS

- .1 Compliance: Comply with manufacturer's written data, including product technical bulletins, product catalogue installation instructions, product carton installation instructions, and data sheets.

3.2 EXAMINATION

- .1 Verify that openings for glazing are correctly sized and within tolerance.
- .2 Verify that surfaces of glazing channels or recesses are clean, free of obstructions, and ready to receive glazing.

3.3 PREPARATION

- .1 Clean contact surfaces with solvent and wipe dry.
- .2 Seal porous glazing channels or recesses with substrate compatible primer or sealer.
- .3 Prime surfaces scheduled to receive sealant.

3.4 INSTALLATION: EXTERIOR WET/DRY METHOD (PREFORMED TAPE AND SEALANT)

- .1 Perform work in accordance with GANA Glazing Manual, IGMAC and Laminators Safety Glass Association - Standards Manual for glazing installation methods.
- .2 Install to window manufactures recommendations.

3.5 INSTALLATION: INTERIOR - DRY METHOD (TAPE AND TAPE)

- .1 Perform work in accordance with GANA Glazing Manual, IGMAC and Laminators Safety Glass Association - Standards Manual for glazing installation methods.
- .2 Cut glazing tape to length and set against permanent stops, projecting 1.6 mm above sight line.
- .3 Place setting blocks at ¼ points, with edge block maximum 150 mm from corners.
- .4 Rest glazing on setting blocks and push against tape for full contact at perimeter of light or unit.
- .5 Place glazing tape on free perimeter of glazing in same manner described.

- .6 Install removable stop without displacement of tape. Exert pressure on tape for full continuous contact.
- .7 Knife trim protruding tape.

3.6 **CLEANING**

- .1 Perform cleaning after installation to remove construction and accumulated environmental dirt. Remove traces of primer, caulking.
- .2 Remove glazing materials from finish surfaces.
- .3 Remove labels after work is complete.
- .4 Clean glass using approved non-abrasive cleaner in accordance with manufacture's instructions.
- .5 Upon completion of installation, remove surplus materials, rubbish, tools and equipment barriers.

3.7 **PROTECTION OF FINISHED WORK**

- .1 After installation, mark light with an "X" by using removable plastic tape or paste.

END OF SECTION

Part 1 General

1.1 REFERENCES

- .1 American Society for Testing and Materials International, (ASTM)
 - .1 ASTM C36/C36M-03e1 Specification for Gypsum Wallboard.
 - .2 ASTM C475/C475M-02(2007), Specification for Joint Compound and Joint Tape for Finishing Gypsum Board.
 - .3 ASTM C514-04(2009), Specification for Nails for the Application of Gypsum Board.
 - .4 ASTM C840-08, Specification for Application and Finishing of Gypsum Board.
 - .5 ASTM C954-10, Specification for Steel Drill Screws for the Application of Gypsum Panel Products or Metal Plaster Bases to Steel Studs From 0.033 in. (0.84 mm) to 0.112 in. (2.84 mm) in Thickness.
 - .6 ASTM C1002-07, Specification for Steel Self-Piercing Tapping Screws for the Application of Gypsum Panel Products or Metal Plaster Bases to Wood Studs or Steel Studs.
 - .7 ASTM C1047-10a, Specification for Accessories for Gypsum Wallboard and Gypsum Veneer Base.
 - .8 ASTM C1177/C1177M-08, Specification for Glass Mat Gypsum Substrate for Use as Sheathing.
 - .9 ASTM C1178/C1178M-08, Standard Specification for Glass Mat Water-Resistant Gypsum Backing Board.
- .2 Canadian General Standards Board (CGSB)
 - .1 CAN/CGSB-51.34-M86 (R1988), Vapour Barrier, Polyethylene Sheet for Use in Building Construction.

1.2 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Submit submittals in accordance with Section 01 33 00.
- .2 Submit fire rated partition assemblies, ULC Design No.'s to Consultant for approval.
- .3 Submit product data sheets for each type of gypsum board.

1.3 DELIVERY, STORAGE AND HANDLING

- .1 Deliver materials in original packages, containers or bundles bearing manufacturer's brand name and identification.
- .2 Store materials inside, level, under cover. Keep dry. Protect from weather, other elements and damage from construction operations and other causes.
- .3 Handle gypsum boards to prevent damage to edges, ends or surfaces. Protect metal accessories and trim from being bent or damaged.

1.4 SITE ENVIRONMENTAL REQUIREMENTS

- .1 Maintain temperature minimum 10 degrees C, maximum 21 degrees C for 48 hours prior to and during application of gypsum boards and joint treatment, and for at least 48 hours after completion of joint treatment.
- .2 Apply board and joint treatment to dry, frost free surfaces.
- .3 Ventilation: Ventilate building spaces as required to remove excess moisture that would prevent drying of joint treatment material immediately after its application.

Part 2 Products

2.1 MATERIALS

- .1 Standard board: to ASTM C36/C36M regular, and Type X, thickness minimum 15.9 mm, 1200 mm wide x maximum practical length, ends square cut, edges bevelled.
- .2 Glass mat gypsum substrate sheathing: to ASTM C1177, regular and type X, thickness as indicated, 1200 mm wide x maximum practical length.

- .3 Glass mat water-resistant gypsum backing board: to ASTM C1178/C1178M, thickness as indicated, 1200 mm wide x maximum practical length.
- .4 Metal furring runners, hangers, tie wires, inserts, anchors: to ASTM.
- .5 Drywall furring channels: 0.5 mm core thickness galvanized steel channels for screw attachment of gypsum board.
- .6 Resilient drywall furring: 0.5 mm base steel thickness galvanized steel for resilient attachment of gypsum board.
- .7 Steel drill screws: to ASTM C1002.
- .8 Laminating compound: as recommended by manufacturer, asbestos-free.
- .9 Casing beads, corner beads, control joints and edge trim: to ASTM C1047, zinc-coated by electrolytic process 0.5 mm base thickness, perforated flanges, one piece length per location.
- .10 Sealants: in accordance with Section 07 92 00 - Joint Sealants.
- .11 Acoustic sealant: in accordance with Section 07 92 00 - Joint Sealants.
- .12 Polyethylene: to CAN/CGSB-51.34, Type 2, 0.15 mm thick.
- .13 Insulating strip: rubberized, moisture resistant, 3 mm thick cork, closed cell neoprene strip, 12 mm wide, with self sticking permanent adhesive on one face, lengths as required.
- .14 Joint compound: to ASTM C475, asbestos-free.

Part 3 Execution

3.1 ERECTION

- .1 Do application and finishing of gypsum board in accordance with ASTM C840 except where specified otherwise.
- .2 Erect hangers and runner channels for suspended gypsum board ceilings in accordance with ASTM C840 except where specified otherwise.
- .3 Support light fixtures by providing additional ceiling suspension hangers within 150 mm of each corner and at maximum 600 mm around perimeter of fixture.
- .4 Install work level to tolerance of 1:1200.
- .5 Frame with furring channels, perimeter of openings for access panels, light fixtures, diffusers, grilles.
- .6 Install 19 x 64 mm furring channels parallel to, and at exact locations of steel stud partition header track.
- .7 Furr for gypsum board faced vertical bulkheads within and at termination of ceilings.
- .8 Furr above suspended ceilings for gypsum board fire and sound stops and to form plenum areas as indicated.
- .9 Install wall furring for gypsum board wall finishes in accordance with ASTM C840, except where specified otherwise.
- .10 Furr openings and around built-in equipment, cabinets, access panels, on four sides. Extend furring into reveals. Check clearances with equipment suppliers.
- .11 Furr duct shafts, beams, columns, pipes and exposed services where indicated.
- .12 Erect drywall resilient furring transversely across studs, joists, spaced maximum 600 mm on centre and not more than 6" (150 mm) from ceiling/wall juncture. Secure to each support with 25 mm drywall screw.
- .13 Install 150 mm continuous strip of 12.7 mm gypsum board along base of partitions where resilient furring installed.

3.2 APPLICATION

- .1 Apply single layer gypsum board to metal, wood furring or framing using screw fasteners. Maximum spacing of screws 300 mm on centre.
 - .1 Single-Layer Application:
 - .1 Apply gypsum board on ceilings prior to application of walls in accordance with ASTM C840.
 - .2 Apply gypsum board vertically or horizontally, providing sheet lengths that will minimize end joints.
 - .2 Double-Layer Application:

- .1 Install gypsum board for base layer and exposed gypsum board for face layer.
- .2 Apply base layer to ceilings prior to base layer application on walls; apply face layers in same sequence. Offset joints between layers at least 10"(250 mm).
- .3 Apply base layers at right angles to supports unless otherwise indicated.
- .4 Apply base layer on walls and face layers vertically with joints of base layer over supports and face layer joints offset at least 250 mm with base layer joints.
- .2 Apply 12 mm diameter bead of acoustic sealant continuously around periphery of each face of partitioning to seal gypsum board/structure junction where partitions abut fixed building components. Seal full perimeter of cut-outs around electrical boxes, ducts, in partitions where perimeter sealed with acoustic sealant.
- .3 Install ceiling boards in direction that will minimize number of end-butt joints. Stagger end joints at least 10" (250 mm).
- .4 Install gypsum board on walls vertically to avoid end-butt joints. At stairwells and similar high walls, install boards horizontally with end joints staggered over studs, except where local codes or fire-rated assemblies require vertical application.
- .5 Install gypsum board with face side out.
- .6 Do not install damaged or damp boards.
- .7 Locate edge or end joints over supports. Stagger vertical joints over different studs on opposite sides of wall.
- .8 Install glass mat water-resistant gypsum backing board behind all ceramic tile finishes.

3.3

INSTALLATION

- .1 Erect accessories straight, plumb or level, rigid and at proper plane. Use full length pieces where practical. Make joints tight, accurately aligned and rigidly secured. Mitre and fit corners accurately, free from rough edges. Secure [using contact adhesive for full length.
- .2 Install casing beads around perimeter of suspended ceilings.
- .3 Install casing beads where gypsum board butts against surfaces having no trim concealing junction and where indicated. Seal joints with sealant.
- .4 Install insulating strips continuously at edges of gypsum board and casing beads abutting metal window and exterior door frames, to provide thermal break.
- .5 Construct control joints of preformed units two back-to-back casing beads set in gypsum board facing and supported independently on both sides of joint.
- .6 Provide continuous polyethylene dust barrier behind and across control joints.
- .7 Locate control joints at changes in substrate construction, at approximate 10 m spacing on long corridor runs, at approximate 15 m spacing on ceilings.
- .8 Install control joints straight and true.
- .9 Construct expansion joints as detailed at building expansion and construction joints. Provide continuous dust barrier.
- .10 Install expansion joint straight and true.
- .11 Install cornice cap where gypsum board partitions do not extend to ceiling.
- .12 Fit cornice cap over partition, secure to partition track with two rows of sheet metal screws staggered at 300 mm on centre.
- .13 Splice corners and intersections together and secure to each member with 3 screws.
- .14 Install access doors to electrical and mechanical fixtures specified in respective sections.
 - .1 Rigidly secure frames to furring or framing systems.
- .15 Finish face panel joints and internal angles with joint system consisting of joint compound, joint tape and taping compound installed according to manufacturer's directions and feathered out onto panel faces.
- .16 Gypsum Board Finish: finish gypsum board walls and ceilings to following levels in accordance with Association of the Wall and Ceiling Industries (AWCI) International Recommended Specification on Levels of Gypsum Board Finish:
 - .1 Levels of finish:
 - .1 Level 1: Embed tape for joints and interior angles in joint compound. Surfaces to be free of excess joint compound; tool marks and ridges are acceptable. In unfinished areas.

- .2 Level 4: Embed tape for joints and interior angles in joint compound and apply three separate coats of joint compound over joints, angles, fastener heads and accessories; surfaces smooth and free of tool marks and ridges. For all finished areas.
- .17 Finish corner beads, control joints and trim as required with two coats of joint compound and one coat of taping compound, feathered out onto panel faces.
- .18 Fill screw head depressions with joint and taping compounds to bring flush with adjacent surface of gypsum board so as to be invisible after surface finish is completed.
- .19 Sand lightly to remove burred edges and other imperfections. Avoid sanding adjacent surface of board.
- .20 Completed installation to be smooth, level or plumb, free from waves and other defects and ready for surface finish.
- .21 Provide protection that ensures gypsum drywall work will remain without damage or deterioration at time of substantial completion.

3.4

SCHEDULES

- .1 Construct fire rated assemblies where indicated.

END OF SECTION

Part 1 General

1.1 REFERENCES

- .1 American Society for Testing and Materials (ASTM)
 - .1 ASTM C 645-11a, Standard Specification for Non-structural Steel Framing Members.
 - .2 ASTM C 754-92(1999), Standard Specification for Installation of Steel Framing Members to Receive Screw-Attached Gypsum Panel Products.

1.2 WASTE MANAGEMENT AND DISPOSAL

- .1 Separate and recycle waste materials in accordance with Section 01 74 19 - Construction/Demolition Waste Management And Disposal

Part 2 Products

2.1 MATERIALS

- .1 Non-load bearing channel stud framing: to ASTM C 645, stud size as indicated, roll formed from hot dipped galvanized steel sheet, for screw attachment of gypsum board. Knock-out service holes at 460 mm centres.
 - .1 Stud thickness as required for wall height.
- .2 Floor and ceiling tracks: to ASTM C 645, in widths to suit stud sizes, 32 mm flange height.
- .3 Metal channel stiffener: standard size, 1.4 mm thick cold rolled steel, coated with rust inhibitive coating.
- .4 Acoustical sealant: to CAN/CGSB-19.21.
- .5 Insulating strip: rubberized, moisture resistant 3 mm thick foam strip, 12 mm wide, with self sticking adhesive on one face, lengths as required.

Part 3 Execution

3.1 ERECTION

- .1 Align partition tracks at floor and ceiling and secure at 600 mm o.c. maximum.
- .2 Install damp proof course under stud shoe tracks of partitions on slabs on grade.
- .3 Place studs vertically at indicated spacing and not more than 50 mm from abutting walls, and at each side of openings and corners. Position studs in tracks at floor and ceiling. Cross brace steel studs as required to provide rigid installation to manufacturer's instructions.
- .4 Erect metal studding to tolerance of 1:1000.
- .5 Attach studs to bottom and ceiling.
- .6 Co-ordinate simultaneous erection of studs with installation of service lines. When erecting studs ensure web openings are aligned.
- .7 Co-ordinate erection of studs with installation of door/window frames and special supports or anchorage for work specified in other Sections.
- .8 Provide two studs extending from floor to ceiling at each side of openings wider than stud centres specified. Secure studs together, 50 mm apart using column clips or other approved means of fastening placed alongside frame anchor clips.
- .9 Install heavy gauge single jamb studs at openings.
- .10 Erect track at head of door/window openings and sills of sidelight/window openings to accommodate intermediate studs. Secure track to studs at each end, in accordance with manufacturer's instructions. Install intermediate studs above and below openings in same manner and spacing as wall studs.
- .11 Frame openings and around built-in equipment, cabinets, access panels, on four sides. Extend framing into reveals. Check clearances with equipment suppliers.
- .12 Provide 40 mm stud or furring channel secured between studs for attachment of fixtures behind lavatory basins, toilet and bathroom accessories, and other fixtures including grab bars and towel rails, attached to steel stud partitions.

99% REVIEW

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- .13 Install steel studs or furring channel between studs for attaching electrical and other boxes.
 - .14 Extend partitions to ceiling height except where noted otherwise on drawings.
 - .15 Maintain clearance under beams and structural slabs to avoid transmission of structural loads to studs. Use 50 mm leg ceiling tracks. Use double track slip joint as indicated.
 - .16 Install continuous insulating strips to isolate studs from un insulated surfaces.
 - .17 Install two continuous beads of acoustical sealant insulating strip under studs and tracks around perimeter of sound control partitions.

END OF SECTION

Part 1 General

1.1 REFERENCES

- .1 Terrazzo Tile and Marble Association of Canada (TTMAC)
 - .1 Tile Specification Guide 09300 2009-2010, Tile Installation Manual.
 - .2 Hard Surface Maintenance Guide.

1.2 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Submit submittals in accordance with Section 01 33 00.
- .2 Submit product data. Include manufacturer's information on:
 - .1 Tile, marked to show each type, size, and shape required.
 - .2 Mortar and grout.
 - .3 Levelling compound.
 - .4 Transition strips.
- .3 Floor tile: submit duplicate 300 x 300 mm sample panels of each colour, texture, size, and pattern of tile.
- .4 Adhere tile samples to 11 mm thick plywood and grout joints to represent project installation.
- .5 Submit samples of Transition strips, wall and cove trim.

1.3 DELIVERY, STORAGE AND HANDLING

- .1 Deliver materials in containers with labels legible and intact and grade-seals unbroken.
- .2 Store material so as to prevent damage or contamination.
- .3 Store materials in a dry area, protected from freezing, staining and damage.
- .4 Store cementitious materials on a dry surface.

1.4 ENVIRONMENTAL CONDITIONS

- .1 Maintain air temperature and structural base temperature at ceramic tile installation area above 12 °C for 48 h before, during, and 48 h after, installation.
- .2 Do not install tiles at temperatures less than 12 °C or above 38 °C.

1.5 EXTRA MATERIAL

- .1 Provide maintenance materials in accordance with Section 01 33 00.
- .2 Provide minimum 2% of each type and colour of tile required for project for maintenance use. Store where directed.
- .3 Maintenance material to be of same production run as installed material.

Part 2 Products

2.1 TILE CT-1

- .1 Manufacturer: Olympia
- .2 Product: Omina series
- .3 Size: 12" x 12"
- .4 Colour: Allow for two colours.

2.2 BASE

- .1 Manufacturer: Olympia
- .2 Product: - Omina series cut from floor tile, height as indicated
- .3 Colour Allow for two colours.
- .4 Trim: Provide Schluter aluminum trim to top exposed edge.

2.3 TILE CT- 2.

- .1 Manufacturer: Olympia
- .2 Product: Quebec series

-
- .3 Colour: Allow for two colours
-
- 2.4 WALL TILE CT- 3.**
 - .1 Manufacturer: Olympia
 - .2 Product: Maple Leaf
 - .3 Colour: Allow for two colours
-
- 2.5 MORTAR AND ADHESIVE MATERIALS**
 - .1 Water: potable and free of minerals and chemicals which are detrimental to mortar and grout mixes.
 - .2 Thin set bond coat: polymer modified.
-
- 2.6 GROUT**
 - .1 Thin set system grout: polymer modified:
 - .2 Colours: Allow for 8 colours.
-
- 2.7 ACCESSORIES**
 - .1 All Tiled outside corners: finish with Schluter – Rondec or Schluter Diaplas rounded moulding aluminum.
 - .2 Transition Strips, floor divider strips, wall and cove trim: purpose made metal extrusion.
 - .1 Between tile and sheet vinyl: Schluter Reno, finish AE.
 - .2 Between tile and carpet: Schluter Reno-TK, finish AE
 - .3 Sealant: in accordance with Section 07 92 00 - Joint Sealants.
 - .4 Floor sealer and protective coating: to tile and grout manufacturer's recommendations.
-
- 2.8 CLEANING COMPOUNDS**
 - .1 Specifically designed for cleaning masonry and concrete and which will not prevent bond of subsequent tile setting materials including patching and levelling compounds and elastomeric waterproofing membrane and coat.
 - .2 Materials containing acid or caustic material are not acceptable.
-
- Part 3 Execution**
- 3.1 WORKMANSHIP**
 - .1 Do tile work in accordance with TTMAC Tile Installation Manual 2009-2010, "Ceramic Tile", except where specified otherwise.
 - .2 Apply tile to clean and sound surfaces.
 - .3 Fit tile around corners, fitments, fixtures, drains and other built-in objects. Maintain uniform joint appearance. Cut edges smooth and even. Do not split tiles.
 - .4 Install purpose made cove to manufacturer's instructions.
 - .5 Maximum surface tolerance 1:800.
 - .6 Make joints between tile uniform and approximately 1.5 mm wide, plumb, straight, true, even and flush with adjacent tile. Ensure sheet layout not visible after installation. Align patterns.
 - .7 Lay out tiles so perimeter tiles are minimum 1/2 size.
 - .8 Sound tiles after setting and replace hollow-sounding units to obtain full bond.
 - .9 Make internal angles square, external angles rounded.
 - .10 Use round edged tiles at termination of wall tile panels, except where panel abuts projecting surface or differing plane.
 - .11 Install divider strips at junction of tile flooring and dissimilar materials.
 - .12 Install wall and cove trim at junction of tile and dissimilar materials.
 - .13 Allow minimum 24 h after installation of tiles, before grouting.
 - .14 Clean installed tile surfaces after installation and grouting cured.

-
- 3.2 FLOOR TILE**
.1 Install in accordance with TTMAC details.
- 3.3 WALL TILE**
.1 Install in accordance with TTMAC details.
- 3.4 FLOOR SEALER AND PROTECTIVE COATING**
.1 Apply in accordance with manufacturer's instructions.

END OF SECTION

Part 1 General

1.1 REFERENCES

- .1 American Society for Testing and Materials (ASTM)
 - .1 ASTM E1264-98, Classification for Acoustical Ceiling Products.
- .2 Underwriters Laboratories of Canada (ULC)
 - .1 CAN/ULC-S102-88(R2000), Surface Burning Characteristics of Building Materials.

1.2 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Submit submittals in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Submit duplicate samples of each type acoustical units.

1.3 ENVIRONMENTAL REQUIREMENTS

- .1 Permit wet work to dry before commencement of installation.
- .2 Maintain uniform minimum temperature of 15 deg C and humidity of 20 - 40% before and during installation.
- .3 Store materials in work area 48 hours prior to installation.

1.4 QUALITY ASSURANCE

- .1 Regulatory Requirements: Fire-resistance rated floor/ceiling and roof/ceiling assembly: certified by Canadian Certification Organization accredited by Standards Council of Canada.

Part 2 Products

2.1 MATERIALS

- .1 Acoustic units for suspended ceiling system non fire rated:
- .2 Type 1
 - .1 Size: 24: x 48" x 5/8"
 - .2 Edge: square lay-in
 - .3 Colour: White
 - .4 Acceptable material: Armstrong Dune 1773

Part 3 Execution

3.1 EXAMINATION

- .1 Do not install acoustical panels and tiles until work above ceiling has been inspected by Construction Manager.

3.2 INSTALLATION

- .1 Install acoustical panels and tiles in ceiling suspension system.

3.3 APPLICATION

- .1 Install acoustic units to clean, dry and firm substrate.
- .2 Install acoustical units parallel to building lines with edge unit not less than 50% of unit width. Refer to reflected ceiling plan.
- .3 Scribe acoustic units to fit adjacent work. Butt joints tight, terminate edges with moulding.

3.4

INTERFACE WITH OTHER WORK

- .1 Co-ordinate ceiling work to accommodate components of other sections, such as light fixtures, diffusers, access doors, speakers, sprinkler heads, to be built into acoustical ceiling components.

Part 1 General

1.1 RELATED WORK

- .1 Trim for recessed mechanical fixtures and recessed electrical fixtures.

1.2 REFERENCES

- .1 American Society for Testing and Materials (ASTM International)
- .1 ASTM C635/C645M-07, Specifications for the Manufacture, Performance and Testing of Metal Suspension Systems for Acoustical Tile and Lay-In Panel Ceilings.
- .2 ASTM C636/C636M-08, Practice for Installation of Metal Ceiling Suspension Systems for Acoustical Tile and Lay-In Panels.

1.3 DESIGN REQUIREMENTS

- .1 Maximum deflection: 1/360th of span to ASTM C635 deflection test.

1.4 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Submit submittals in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Submit reflected ceiling plans for special grid patterns as indicated.
- .3 Indicate lay-out, insert and hanger spacing and fastening details, splicing method for main and cross runners, location of access splines, change in level details, access door dimensions, and locations and acoustical unit support at ceiling fixture, lateral bracing and accessories.
- .4 Submit one representative model of each type ceiling suspension system.
- .5 Ceiling system to show basic construction and assembly, treatment at walls, recessed fixtures, splicing, interlocking, finishes, acoustical unit installation.

1.5 DELIVERY, STORAGE AND HANDLING

- .1 Deliver, store and handle materials in accordance with Section 01 61 00 - Common Product Requirements and with manufacturer's written instructions
- .2 Packaging Waste Management: remove for reuse and return by manufacturer of pallets, crates, padding, and packaging materials in accordance with Section 01 74 19 - Construction/Demolition Waste Management and Disposal and Section 01 47 15 - LEED Requirements

Part 2 Products

2.1 MATERIALS

- .1 Intermediate uty system to ASTM C635.
- .2 Basic materials for suspension system: commercial quality cold rolled steel zinc coated.
- .3 Suspension system: non fire rated, made up as follows:
- .1 Exposed tee bar grid.
- .1 Acceptable material: Armstrong Prelude XL 15/16" exposed tee.
- .4 Exposed tee bar grid components: white. Components die cut. Main tee with double web, rectangular bulb and 25 mm rolled cap on exposed face. Cross tee with rectangular bulb; web extended to form positive interlock with main tee webs; lower flange extended and offset to provide flush intersection.
- .5 Hanger wire: galvanized soft annealed steel wire.
- .1 3.6 mm diameter for access tile ceilings.
- .2 To ULC design requirements for fire rated assemblies.
- .3 2.6 mm diameter for other ceilings.
- .6 Hanger inserts: purpose made.
- .7 Carrying channels: manufacturer's standard.

- .8 Accessories: splices, clips, wire ties, retainers and wall moulding flush/reveal, to complement suspension system components, as recommended by system manufacturer.
- .9 Ceiling tile edge: Armstrong Axiom knife edge with factory corners.

Part 3 Execution

3.1 INSTALLATION

- .1 Installation: in accordance with ASTM C636 except where specified otherwise.
- .2 Install suspension system to manufacturer's instructions and Certification Organizations tested design requirements.
- .3 Do not erect ceiling suspension system until work above ceiling has been inspected by Construction Manager.
- .4 Secure hangers to overhead structure using attachment methods as indicated and as acceptable to Construction Manager.
- .5 Install hangers spaced at maximum 1200 mm centres and within 150 mm from ends of main tees.
- .6 Lay out centre line of ceiling both ways, to provide balanced borders at room perimeter, with border units not less than 50% of standard unit width according to reflected ceiling plan..
- .7 Ensure suspension system is co-ordinated with location of related components.
- .8 Install wall moulding to provide correct ceiling height.
- .9 Completed suspension system to support super-imposed loads, such as lighting fixtures, diffusers, grilles, and speakers.
- .10 Support at light fixtures, diffusers with additional ceiling suspension hangers within 150 mm of each corner and at maximum 600 mm around perimeter of fixture.
- .11 Interlock cross member to main runner to provide rigid assembly.
- .12 Frame at openings for light fixtures, air diffusers, speakers and at changes in ceiling heights.
- .13 Finished ceiling system to be square with adjoining walls and level within 1:1000.
- .14 Install trim to manufacturer's written instructions

3.2 CLEANING

- .1 Touch up scratches, abrasions, voids and other defects in painted surfaces.

END OF SECTION

Part 1 General

1.1 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Submit submittals in accordance with Section 01 33 00.
- .2 Submit tape manufacturer's installation instructions: Indicate primers, adhesives and cleaning procedures.
- .3 Submit product data sheet describing physical and performance characteristics.
- .4 Submit duplicate 50 mm wide x 300 mm long of tape
- .5 Closeout submittals: Submit operation and maintenance data for incorporation into manual specified in Section 01 00 02.

Part 2 Products

2.1 SAFETY TAPE

- .1 Aluminum oxide 60 grit system with aggressive mineral abrasive compound with a double epoxy layer
- .2 Meets NFSI 101-A "High Traction, and OSHA 1910.24 / 1910.26.
- .3 Size: 50 mm wide x full length of tread
- .4 Colour: yellow
- .5 Adhesives / primers: as recommended by manufacture.

Part 3 Execution

3.1 SURFACE PREPARATION

- .1 Clean substrate to manufacturer's written instructions.

3.2 INSTALLATION

- .1 Apply primers, adhesives as recommended by manufacturer.
- .2 Apply tape full length of tread wrinkle free.
- .3 Apply tape straight and even with the edge of the thread.

END OF SECTION

Part 1 General

1.1 REFERENCES

- .1 ASTM F1303-04 (2009), Specification for Sheet Vinyl Floor Covering with Backing.

1.2 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Submit submittals in accordance with Section 01 33 00.
- .2 Submit duplicate 300 x 300 mm sample pieces of sheet material, 300 mm long base, nosing, feature strips, treads, and edge strips.
- .3 Provide maintenance data for resilient flooring for incorporation into manual.

1.3 ENVIRONMENTAL REQUIREMENTS

- .1 Maintain air temperature and structural base temperature at flooring installation area above 20° for 48 hours before, during and 48 hours after installation.

Part 2 Products

2.1 MATERIALS

- .1 Sheet vinyl: SV Sheet vinyl homogeneous to F1303
 - .1 Acceptable material: Johnsonite Optima
 - .2 Thickness: 2 mm
 - .3 Non wax
 - .3 Colour: allow for 6 colours.
- .2 Heat welding rod: Acceptable material Vinyl welding rod by flooring manufacturer, sized to suit application, colours allow for 6 colours as selected by Construction Manager from manufacturer's standard range.
- .3 Resilient base for rubber sheet: continuous, top set, complete with pre-moulded end stops and external corners:
 - .1 Type: rubber.
 - .2 Style: coved/toeless for carpet tiles
 - .3 Thickness: 6 mm.
 - .4 Height: 100 mm
 - .5 Lengths: cut lengths minimum 2400 mm.
 - .6 Acceptable material: Johnsonite
 - .7 Colours: allow for 6 colours as selected by Construction Manager.
- .4 Primers and adhesives: of types recommended by resilient flooring manufacturer for specific material on applicable substrate, above, on or below grade.
- .5 Sub-floor filler and leveller: white premix latex requiring water only to produce cementitious paste as recommended by flooring manufacturer for use with their product.
- .6 Metal edge strips: Aluminum with lip to extend under floor finish, shoulder flush with top of adjacent floor finish.
- .7 External corner protectors: aluminum, type recommended by flooring manufacturer.
- .8 Edging to floor penetrations: aluminum type recommended by flooring manufacturer.

Part 3 Execution

3.1 SITE VERIFICATION OF CONDITIONS

- .1 Ensure concrete floors are clean and dry by using test methods recommended by flooring manufacturer.
- .2 Do not install flooring on concrete floors containing curing agents, sealers, or hardeners, co-ordinate with Division 3.

3.2 PREPARATION

- .1 Remove sub-floor ridges and bumps. Fill low spots, cracks, joints, holes and other defects with sub-floor filler.
- .2 Clean floor and apply filler; trowel and float to leave smooth, flat hard surface. Prohibit traffic until filler cured and dry.
- .3 Seal concrete slab to resilient flooring manufacturer's printed instructions.

3.3 APPLICATION: FLOORING

- .1 Provide a high ventilation rate, with maximum outside air, during installation, and for 48 to 72 hours after installation. If possible, vent directly to the outside. Do not let contaminated air re-circulate through a district or whole building air distribution system.
- .2 Apply low VOC, water based adhesive uniformly using recommended trowel. Do not spread more adhesive than can be covered by flooring before initial set takes place.
- .3 Lay flooring with seams parallel to building lines to produce a minimum number of seams. Border widths minimum 1/3 width of full material.
- .4 Run sheets in direction of traffic. Double cut sheet joints and continuously seal, heat weld according to manufacturer's printed instructions.
- .5 Heat weld seams of sheet flooring in accordance with manufacturer's printed instructions.
- .6 As installation progresses, and after installation roll flooring with 45 kg minimum roller to ensure full adhesion.
- .7 Cut flooring neatly around fixed objects.
- .8 Install feature strips and floor markings where indicated. Fit joints tightly.
- .9 Install flooring in pan type floor access covers. Maintain floor pattern.
- .10 Continue flooring over areas which will be under built-in furniture.
- .11 Continue flooring through areas to receive movable type partitions without interrupting floor pattern.
- .12 Terminate flooring at centreline of door in openings where adjacent floor finish or colour is dissimilar.
- .13 Install metal edge strips at unprotected or exposed edges where flooring terminates.

3.4 APPLICATION: BASE

- .1 Lay out base to keep number of joints at minimum.
- .2 Clean substrate and prime with one coat of adhesive.
- .3 Apply adhesive to back of base.
- .4 Set base against wall and floor surfaces tightly by using 3 kg hand roller.
- .5 Install straight and level to variation of 1:1000.
- .6 Scribe and fit to door frames and other obstructions. Use pre-moulded end pieces at flush door frames.
- .7 Cope internal corners. Use pre-moulded corner units for right angle external corners. Use formed straight base material for external corners of other angles.
- .8 Use coved type / toeless for carpet.
- .9 Heat weld base in accordance with manufacturer's printed instructions.

3.5 CLEANING

- .1 Remove excess adhesive from floor, base and wall surfaces without damage. Clean floor and base surface to flooring manufacturer's printed instructions.

3.6 PROTECTION

- .1 Protect new floors from time of final set of adhesive until final inspection. Prohibit traffic on floor for 48 hours after installation.

END OF SECTION

Part 1 General

1.1 REFERENCES

- .1 American Association of Textile Chemists and Colorists (AATCC)
 - .1 AATCC 134-2001, Electrostatic Propensity of Carpet.
 - .2 Optical Density of Smoke Generated by Solid Materials.
- .2 Carpet and Rug Institute (CRI)
 - .1 CRI-104-96, Standard Installation of Commercial Carpet.
- .3 Underwriters' Laboratories of Canada (ULC)
 - .1 CAN/ULC-S102-88 (R2000), Surface Burning Characteristics of Building Materials and Assemblies.
 - .2 CAN/ULC-S102.2-88 (R2000), Surface Burning Characteristics of Flooring, Floor Covering and Miscellaneous Materials and Assemblies.

1.2 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Submit submittals in accordance with Section 01 33 00.
- .2 Submit carpet schedule using same room designations indicated on drawings.
- .3 Submit carpet manufacturer's installation instructions: Indicate special procedures and perimeter conditions requiring special attention.
- .4 Submit product data sheet for each carpet describing physical and performance characteristics, sizes, patterns, colours, and methods of installation, adhesive, carpet protection and subfloor patching compound.
- .5 Submit WHMIS MSDS - Material Safety Data Sheets acceptable to Labour Canada and Health Canada for carpet adhesive and seam adhesive. Indicate VOC content.
- .6 Shop drawings: Indicate locations and size of carpet tiles for carpeted areas.
- .7 Indicate nap direction, open edges, special patterns, and other details required by Construction Manager to clarify work.
- .8 Submit drawings showing columns, doorways, enclosing walls or partitions, built-in cabinets, and locations where cutouts are required as well as direction of carpet pile and pattern, location of edge mouldings and edge bindings to Construction Manager for review prior to installation of carpet.
- .9 Submit duplicate 50 x 50 cm pieces of each type carpet specified, duplicate 225 x 225 mm pieces for each colour selected, 6" (150 mm) lengths of carpet divider strips.
- .10 Closeout submittals: Submit operation and maintenance data for incorporation into manual specified in Section 01 00 02.
- .11 Submit maintenance data: Include maintenance procedures, recommendations for maintenance materials and equipment, and suggested schedule for cleaning.

1.3 QUALIFICATIONS

- .1 Installer Qualifications:
 - .1 Flooring contractor requirements.
 - .1 Specialty contractor normally engaged in this type of work, with prior experience in installation of these types of materials.
 - .2 Certified by carpet manufacturer prior to tender submission.
 - .3 Must not sub-contract labour without written approval of Construction Manager.
- .2 Be responsible for proper product installation, including floor testing and preparation as specified and in accordance with carpet manufacturers written instructions.

1.4 DELIVERY, STORAGE AND HANDLING

- .1 Label packaged materials. For carpet tile products indicate nominal dimensions of tile and indicate installation direction.
- .2 Store packaged materials in original containers or wrapping with manufacturer's seals and labels intact.

- .3 Store carpeting and accessories in location as directed by Consultant. Store carpet and adhesive at minimum temperature of 18°C and relative humidity of maximum 65% for minimum of 48 hours before installation.
- .4 Prevent damage to materials during handling and storage. Keep materials under cover and free from dampness.
- .5 Store materials in area of installation for minimum period of 48 hours prior to installation.
- .6 Tile carpet: store on pallet form as supplied by Manufacturer. Do not stack pallets.

1.5 ENVIRONMENTAL REQUIREMENTS

- .1 Moisture: Ensure substrate is within moisture limits and alkalinity limits prescribed by manufacturer.
- .2 Temperature: Maintain ambient temperature of not less than 18 °C from 48 hours before installation to at least 48 hours after completion of work.
- .3 Relative humidity: Maintain relative humidity between 10 and 65% RH for 48 hours before, during and 48 hours after installation.
- .4 Safety: Comply with requirements of Workplace Hazardous Materials Information System (WHMIS) regarding use, handling, storage, and disposal of hazardous materials.
- .5 Ventilation: Contractor will arrange for a ventilation system to be operated during installation of carpet.

1.6 EXTRA MATERIALS

- .1 Provide extra materials of carpet in accordance with Section 01 33 00 .
- .2 Provide 5% of each colour, pattern and type of carpeting.
- .3 Extra materials to be from same production run as installed materials.
- .4 Identify each package of carpet.
- .5 Deliver to Construction Manager and store where directed by Construction Manager.

Part 2 Products

2.1 TILE CARPET

- .1 Acceptable material:
 - .1 Interface
 - .1 Style: To Scale
 - .2 Style number: 1465202500.
 - .3 Colour: Allow for six colours.
 - .4 Size: 50 x 50 cm
- .2 Backing system: manufacturer's standard.
- .3 Soil/stain protection required: to manufacturer's standard.
- .4 Antimicrobial protection required: to manufacturer's standard.
- .5 Adhesives: Pressure sensitive type: recommended by carpet manufacturer for direct installation of modular carpet of speciality backed carpets, manufacturer's standard.
- .6 Subfloor patching compound: Portland cement base filler, mix with latex and water to form a cementitious paste.

Part 3 Execution

3.1 SUB-FLOOR TREATMENT

- .1 Concrete shall be inspected to determine special care required to make it a suitable foundation for carpet. Cracks 1/8" (3 mm) wide or protrusions over 1/32" (0.8 mm) will be filled and levelled with appropriate and compatible latex patching compound.
- .2 Do not exceed manufacturer's recommendations for patch thickness.
- .3 Large patch areas are to be primed with a compatible primer.
- .4 Concrete substrates shall be cured, clean and dry.
- .5 Concrete substrates shall be free of paint, dirt, grease, oil, curing or parting agents, and other contaminates, including sealers, that may interfere with the bonding of the adhesive.

-
- .6 Wherever a powdery or porous concrete surface is encountered, a primer compatible with the adhesive shall be used to provide a suitable surface for glue-down installation.

3.2 **PREPARATION**

- .1 Prepare floor surfaces in accordance with CRI 104 Standard for Installation of Commercial Carpet.
- .2 Pre-condition carpeting following manufacturer's printed instructions.

3.3 **TILE CARPET**

- .1 Apply acrylic release type adhesive and install modular carpet in accordance with manufacturer's written instructions.
- .2 Lay tile carpet with butt seams.
- .3 Roll tile carpet with appropriate roller for complete contact of carpet with mill-applied adhesive to sub-floor.

3.4 **PROTECTION OF FINISHED WORK**

- .1 Vacuum carpets clean immediately after completion of installation.

END OF SECTION

Part 1 General

1.1 REFERENCES

- .1 Architectural Painting Specifications Manual, Master Painters Institute (MPI).

1.2 QUALITY ASSURANCE

- .1 Contractor shall have a minimum of five years proven satisfactory experience. When requested, provide a list of last three comparable jobs including, job name and location, specifying authority, and consultant.
- .2 Qualified journeymen who have a "Tradesman Qualification Certificate of Proficiency" shall be engaged in painting work. Apprentices may be employed provided they work under the direct supervision of a qualified journeyman in accordance with trade regulations.
- .3 Conform to latest MPI requirements for interior painting work including preparation and priming.
- .4 Materials (primers, paints, coatings, varnishes, stains, lacquers, fillers, thinners, solvents, etc.) shall be in accordance with MPI Painting Specification Manual "Approved Product" listing and shall be from a single manufacturer for each system used.
- .5 Other paint materials such as linseed oil, shellac, turpentine, etc. shall be the highest quality product of an approved manufacturer listed in MPI Painting Specification Manual and shall be compatible with other coating materials as required.
- .6 Retain purchase orders, invoices and other documents to prove conformance with noted MPI requirements when requested by Construction Manager.
- .7 Standard of Acceptance:
 - .1 Walls: No defects visible from a distance of 1000 mm at 90° to surface.
 - .2 Ceilings: No defects visible from floor at 45° to surface when viewed using final lighting source.
 - .3 Final coat to exhibit uniformity of colour and uniformity of sheen across full surface area.

1.3 SCHEDULING OF WORK

- .1 Submit work schedule for various stages of painting to Construction Manager for approval. Submit schedule minimum of 48 hours in advance of proposed operations.
- .2 Obtain written authorization from Construction Manager for any changes in work schedule.

1.4 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Submit submittals in accordance with Section 01 33 00.

1.5

- .1 Submit product data and manufacturer's installation/application instructions for each paint and coating product to be used.
- .2 Upon completion, submit records of products used. List products in relation to finish system and include the following:
 - .1 Product name, type and use.
 - .2 Manufacturer's product number.
 - .3 Colour numbers.
 - .4 Manufacturer's Material Safety Data Sheets (MSDS).
- .3 Submit full range colour sample chips. Indicate where colour availability is restricted.
- .4 Submit duplicate 200 x 300 mm sample panels of each paint, stain with specified paint or coating in colours, gloss/sheen and textures required to MPI Painting Specification Manual standards submitted on the following substrate materials:
 - .1 3 mm plate steel for finishes over metal surfaces.
 - .2 13 mm birch plywood for finishes over wood surfaces.
 - .3 50 mm concrete block for finishes over concrete or concrete masonry surfaces.

- .4 13 mm gypsum board for finishes over gypsum board and other smooth surfaces.
- .5 10 mm cedar, hardboard, plywood for finishes over wood surfaces.
- .5 When approved, sample panels shall become acceptable standard of quality for appropriate on-site surface with one of each sample retained on-site.

1.6 DELIVERY, HANDLING AND STORAGE

- .1 Deliver, store and handle materials in accordance with Section 01 6 00.
- .2 Labels shall clearly indicate:
 - .1 Manufacturer's name and address.
 - .2 Type of paint or coating.
 - .3 Compliance with applicable standard.
 - .4 Colour number in accordance with established colour schedule.
- .3 Remove damaged, opened and rejected materials from site.
- .4 Provide and maintain dry, temperature controlled, secure storage.
- .5 Observe manufacturer's recommendations for storage and handling.
- .6 Store materials and supplies away from heat generating devices.
- .7 Store materials and equipment in a well ventilated area with temperature range 7°C to 30°C.
- .8 Store temperature sensitive products above minimum temperature as recommended by manufacturer.
- .9 Keep areas used for storage, cleaning and preparation, clean and orderly to approval of Construction Manager. After completion of operations, return areas to clean condition to approval of Construction Manager.
- .10 Remove paint materials from storage only in quantities required for same day use.
- .11 Comply with requirements of Workplace Hazardous Materials Information System (WHMIS) regarding use, handling storage, and disposal of hazardous materials.
- .12 Fire Safety Requirements:
 - .1 Provide one 9 kg Type ABC fire extinguisher adjacent to storage area.
 - .2 Store oily rags, waste products, empty containers and materials subject to spontaneous combustion in ULC approved, sealed containers and remove from site on a daily basis.
 - .3 Handle, store, use and dispose of flammable and combustible materials in accordance with the National Fire Code of Canada.

1.7 SITE REQUIREMENTS

- .1 Heating, Ventilation and Lighting:
 - .1 Ventilate enclosed spaces Perform no painting work unless adequate and continuous ventilation and sufficient heating facilities are in place to maintain ambient air and substrate temperatures above 10 °C for 24 hours before, during and after paint application until paint has cured sufficiently.
 - .2 Where required, provide continuous ventilation for seven days after completion of application of paint.
 - .3 Provide temporary ventilating and heating equipment where permanent facilities are not available or supplemental ventilating and heating equipment if ventilation and heating from existing system is inadequate to meet minimum requirements.
 - .4 Perform no painting work unless a minimum lighting level of 323 Lux is provided on surfaces to be painted. Adequate lighting facilities shall be provided by Contractor.
- .2 Temperature, Humidity and Substrate Moisture Content Levels:
 - .1 Unless specifically pre-approved by the specifying body, Paint Inspection Agency and the applied product manufacturer, perform no painting work when:
 - .1 Ambient air and substrate temperatures are below 10 °C.
 - .2 Substrate temperature is over 32 °C unless paint is specifically formulated for application at high temperatures.

- .3 Substrate and ambient air temperatures are expected to fall outside MPI or paint manufacturer's prescribed limits.
- .4 The relative humidity is above 85% or when the dew point is less than 3 °C variance between the air/surface temperature.
- .5 Rain or snow are forecast to occur before paint has thoroughly cured or when it is foggy, misty, raining or snowing at site.
- .2 Perform no painting work when the maximum moisture content of the substrate exceeds:
 - .1 12% for concrete and masonry (clay and concrete brick/block).
 - .2 15% for wood.
 - .3 12% for plaster and gypsum board.
- .3 Conduct moisture tests using a properly calibrated electronic Moisture Meter, except test concrete floors for moisture using a simple "cover patch test".
- .4 Test concrete, masonry and plaster surfaces for alkalinity as required.
- .3 Surface and Environmental Conditions:
 - .1 Apply paint finish only in areas where dust is no longer being generated by related construction operations or when wind or ventilation conditions are such that airborne particles will not affect quality of finished surface.
 - .2 Apply paint only to adequately prepared surfaces and to surfaces within moisture limits noted herein.
 - .3 Apply paint only when previous coat of paint is dry or adequately cured.
 - .4 Apply paint finishes only when conditions forecast for entire period of application fall within manufacturer's recommendations.
 - .5 Do not apply paint when:
 - .1 Temperature is expected to drop below 10 °C before paint has thoroughly cured.
 - .2 Substrate and ambient air temperatures are expected to fall outside MPI or paint manufacturer's limits.
 - .3 Surface to be painted is wet, damp or frosted.
 - .6 Provide and maintain cover when paint must be applied in damp or cold weather. Heat substrates and surrounding air to comply with temperature and humidity conditions specified by manufacturer. Protect until paint is dry or until weather conditions are suitable.
 - .7 Schedule painting operations such that surfaces exposed to direct, intense sunlight are scheduled for completion during early morning.
 - .8 Remove paint from areas which have been exposed to freezing, excess humidity, rain, snow or condensation. Prepare surface again and repaint.
 - .9 Paint occupied facilities in accordance with approved schedule only. Schedule operations to approval of the Construction Manager such that painted surfaces will have dried and cured sufficiently before occupants are affected.
- .4 Additional Interior Application Requirements:
 - .1 Apply paint finishes only when temperature at location of installation can be satisfactorily maintained within manufacturer's recommendations.

Part 2 Products

2.1 LEED REQUIREMENTS

- .1 All site-applied interior paints and coatings must conform the low emission requirements of LEED Canada NC Version 1.1.
- .2 Limits in accordance with Section 01 47 15 - Sustainable Requirements: Construction.
 - .1 Recycled Content Credit MR-4.2.
 - .2 Regional materials Credit MR-5.2.
 - .3 Low-Emitting Materials: Paints and Coatings, Credit EQ-4.2, VOC content to SCAQMD Rule 1113.

2.2 MATERIALS

- .1 Paint materials listed in the MPI Approved Products List (APL) are acceptable for use on this project.
- .2 Paint materials for paint systems shall be products of a single manufacturer.

2.3 COLOURS

- .1 Consultant will provide Colour Schedule.
- .2 Allow for 12 colours.
- .3 Selection of colours will be from manufacturer's full range of colours.
- .4 Where specific products are available in a restricted range of colours, selection will be based on the limited range.
- .5 Second coat in a three coat system to be tinted slightly lighter colour than top coat to show visible difference between coats.

2.4 MIXING AND TINTING

- .1 Perform colour tinting operations prior to delivery of paint to site. On-site tinting of painting materials is allowed only with Construction Manager's written permission.
- .2 Paste, powder or catalyzed paint mixes shall be mixed in strict accordance with manufacturer's written instructions.
- .3 Where thinner is used, addition shall not exceed paint manufacturer's recommendations. Do not use kerosene or any such organic solvents to thin water-based paints.
- .4 Re-mix paint in containers prior to and during application to ensure break-up of lumps, complete dispersion of settled pigment, and colour and gloss uniformity.

2.5 GLOSS/SHEEN RATINGS

- .1 Paint gloss shall be defined as the sheen rating of applied paint, in accordance with the following values:

Gloss Level Category	Units @ 60°	Units @ 85°
G1 - matte finish	0 to 5	max. 10
G2 - velvet finish	0 to 10	10 to 35
G3 - eggshell finish	10 to 25	10 to 35
G4 - satin finish	20 to 35	min. 35
G5 - semi-gloss finish	35 to 70	
G6 - gloss finish	70 to 85	
G7 - high gloss finish	> 85	

- .2 Gloss level ratings of painted surfaces shall be as specified herein and as noted on Finish Schedule.

2.6 INTERIOR PAINTING SYSTEMS

- .1 Concrete Masonry Units: walls.
 - .1 INT 4.2K - Waterborne light industrial gloss level 5 finish
- .2 Structural steel and metal fabrications: columns, beams, joists, stairs, railings, bollards etc:
 - .1 INT 5.1B - Waterborne light industrial.
 - .2 INT 5.1E – Alkyd.
- .3 Galvanized metal: doors, frames, railings, misc. steel, pipes, overhead decking, and ducts.
 - .1 INT 5.3M - High performance architectural latex.
- .4 Metal: doors, frames, metal fabrications
 - .1 INT 5.1E-G5 alkyd
- .5 Plaster and Gypsum Board Ceilings: gypsum wallboard, drywall, "sheet rock type material", etc., and textured finishes
 - .1 INT 9.2a- latex-G3
 - .2 INT 9.2L - Waterborne light industrial G5

-
- .6 Exposed mechanical /electrical items not prefinished
 - .1 Metal: INT 5.1Q-G5 (latex over alkyd primer)
 - .2 Aluminum: 5.4H-G5 (latex)

 - 2.7 EXTERIOR PAINTING SYSTEMS**
 - .1 Steel and Metal Fabrications
 - .1 EXT 5.1D-G5 (alkyd)

 - Part 3 Execution**
 - 3.1 GENERAL**
 - .1 Perform preparation and operations for interior painting in accordance with MPI Painting Specifications Manual except where specified otherwise.
 - .2 Apply paint materials in accordance with paint manufacturer's written application instructions.

 - 3.2 EXISTING CONDITIONS**
 - .1 Investigate existing substrates for problems related to proper and complete preparation of surfaces to be painted. Report to Construction Manager damages, defects, unsatisfactory or unfavourable conditions before proceeding with work.
 - .2 Conduct moisture testing of surfaces to be painted using a properly calibrated electronic moisture meter, except test concrete floors for moisture using a simple "cover patch test" and report findings to Construction Manager. Do not proceed with work until conditions fall within acceptable range as recommended by manufacturer.
 - .3 Maximum moisture content as follows:
 - .1 Stucco, Plaster and Gypsum Board: 12%.
 - .2 Concrete: 12%.
 - .3 Clay and Concrete Block/Brick: 12%.
 - .4 Wood: 15%.

 - 3.3 PROTECTION**
 - .1 Protect existing building surfaces and adjacent structures from paint splatters, markings and other damage by suitable non-staining covers or masking. If damaged, clean and restore such surfaces as directed by Construction Manager.
 - .2 Protect items that are permanently attached such as Fire Labels on doors and frames.
 - .3 Protect factory finished products and equipment.
 - .4 Protect building occupants in and about the building.
 - .5 Removal of electrical cover plates, light fixtures, surface hardware on doors, bath accessories and other surface mounted equipment, fittings and fastenings shall be done prior to undertaking any painting operations by General Contractor. Items shall be securely stored and re-installed after painting is completed by General Contractor.
 - .6 Move and cover furniture and portable equipment as necessary to carry out painting operations. Replace as painting operations progress.
 - .7 As painting operations progress, place "WET PAINT" signs in occupied areas to approval of Construction Manager.

 - 3.4 CLEANING AND PREPARATION**
 - .1 Clean and prepare surfaces in accordance with MPI Painting Specification Manual requirements. Refer to MPI Manual in regard to specific requirements and as follows:
 - .1 Remove dust, dirt, and other surface debris by vacuuming, wiping with dry, clean cloths or compressed air.
 - .2 Wash surfaces with a biodegradable detergent and bleach where applicable and clean warm water using a stiff bristle brush to remove dirt, oil and other surface contaminants.

- .3 Rinse scrubbed surfaces with clean water until foreign matter is flushed from surface.
- .4 Allow surfaces to drain completely and allow to dry thoroughly.
- .5 Prepare surfaces for water-based painting, water-based cleaners should be used in place of organic solvents.
- .6 Use trigger operated spray nozzles for water hoses.
- .7 Many water-based paints cannot be removed with water once dried. However, minimize the use of kerosene or any such organic solvents to clean up water-based paints.
- .2 Prevent contamination of cleaned surfaces by salts, acids, alkalis, other corrosive chemicals, grease, oil and solvents before prime coat is applied and between applications of remaining coats. Apply primer, paint, or pretreatment as soon as possible after cleaning and before deterioration occurs.
- .3 Where possible, prime surfaces of new wood surfaces before installation. Use same primers as specified for exposed surfaces.
 - .1 Apply vinyl sealer to MPI #36 over knots, pitch, sap and resinous areas.
 - .2 Apply wood filler to nail holes and cracks.
 - .3 Tint filler to match stains for stained woodwork.
- .4 Sand and dust between coats as required to provide adequate adhesion for next coat and to remove defects visible from a distance up to 1000 mm.
- .5 Clean metal surfaces to be painted by removing rust, loose mill scale, welding slag, dirt, oil, grease and other foreign substances in accordance with MPI requirements. Remove
- .6 Traces of blast products from surfaces, pockets and corners to be painted by brushing with clean brushes, blowing with clean dry compressed air, or vacuum cleaning.
- .7 Touch up of shop primers with primer as specified in applicable section. Major touch-up including cleaning and painting of field connections, welds, rivets, nuts, washers, bolts, and damaged or defective paint and rusted areas, shall be by supplier of fabricated material.
- .8 Do not apply paint until prepared surfaces have been accepted by Construction Manager.

3.5 APPLICATION

- .1 Method of application to be as approved by Construction Manager. Apply paint by brush/roller. Conform to manufacturer's application instructions unless specified otherwise.
- .2 Brush and Roller Application:
 - .1 Apply paint in a uniform layer using brush and/or roller of types suitable for application.
 - .2 Work paint into cracks, crevices and corners.
 - .3 Paint surfaces and corners not accessible to brush using spray, daubers and/or sheepskins. Paint surfaces and corners not accessible to roller using brush, daubers or sheepskins.
 - .4 Brush and/or roll out runs and sags, and over-lap marks. Rolled surfaces shall be free of roller tracking and heavy stipple unless approved by Construction Manager.
 - .5 Remove runs, sags and brush marks from finished work and repaint.
- .3 Use dipping, sheepskins or daubers only when no other method is practical in places of difficult access and only when specifically authorized by Construction Manager.
- .4 Apply coats of paint as a continuous film of uniform thickness. Repaint thin spots or bare areas before next coat of paint is applied.
- .5 Allow surfaces to dry and properly cure after cleaning and between subsequent coats for minimum time period as recommended by manufacturer.
- .6 Sand and dust between coats to remove visible defects.
- .7 Finish surfaces both above and below sight lines as specified for surrounding surfaces, including such surfaces as tops of interior cupboards and cabinets and projecting ledges.
- .8 Finish closets and alcoves as specified for adjoining rooms.
- .9 Finish top, bottom, edges and cutouts of doors after fitting as specified for door surfaces.

3.6 MECHANICAL/ELECTRICAL EQUIPMENT

- .1 Unless otherwise specified, paint finished area exposed conduits, piping, hangers, ductwork and other mechanical and electrical equipment with colour and finish to match adjacent surfaces, except as noted otherwise.
- .2 Mechanical and electrical rooms: paint exposed conduits, piping, hangers, ductwork and other mechanical and electrical equipment.
- .3 Other unfinished areas: leave exposed conduits, piping, hangers, ductwork and other mechanical and electrical equipment in original finish and touch up scratches and marks.
- .4 Touch up scratches and marks on factory painted finishes and equipment with paint as supplied by manufacturer of equipment.
- .5 Do not paint over nameplates.
- .6 Keep sprinkler heads free of paint.
- .7 Paint inside of ductwork where visible behind grilles, registers and diffusers with primer and one coat of matt black paint.
- .8 Paint fire protection piping red.
- .9 Paint disconnect switches for fire alarm system and exit light systems in red enamel.
- .10 Paint natural gas piping yellow.
- .11 Paint both sides and edges of backboards for telephone and electrical equipment before installation. Leave equipment in original finish except for touch-up as required, and paint conduits, mounting accessories and other unfinished items.
- .12 Do not paint interior transformers and substation equipment.

3.7 FIELD QUALITY CONTROL

- .1 Advise Construction Manager when surfaces and applied coating is ready for inspection. Do not proceed with subsequent coats until previous coat has been approved.

3.8 RESTORATION

- .1 Clean and re-install all hardware items removed before undertaken painting operations.
- .2 Remove protective coverings and warning signs as soon as practical after operations cease.
- .3 Remove paint splashings on exposed surfaces that were not painted. Remove smears and spatter immediately as operations progress, using compatible solvent.
- .4 Protect freshly completed surfaces from paint droppings and dust to approval of Construction Manager. Avoid scuffing newly applied paint.
- .5 Restore areas used for storage, cleaning, mixing and handling of paint to clean condition as approved by Construction Manager.

END OF SECTION

Part 1 General

1.1 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Submit submittals in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Submit shop drawings, catalogue sheets and full size templates.
- .3 Indicate materials, thicknesses, sizes, finishes, colours, construction details, removable and interchangeable components, mounting methods, schedule of signs.
- .4 Submit full size templates, drawn-to-scale details for individually fabricated or incised lettering indicating word and letter spacing.
- .5 Submit duplicate representative sample of each type sign, sign image and mounting method.

Part 2 Products

2.1 MATERIALS

- .1 Interior signage: Door mounted vandal resistant signage with non glare top surface, concealed letter head liner, side slot for easy removal of liner and integral back mounting plate. Custom tool for removal of liner. Text to be white. Typeface to be Arial. Lettering to be all uppercase. Text height to be 15 mm or as directed by Construction Manager.
 - .1 Sign graphics: construction as above except that text is replaced with symbols. Sign graphics to be well defined, arranged for balanced appearance.
 - .2 Acceptable material: Insign plaque format 7.7.1 (7"x7) standard radius corners.

2.2 FABRICATION

- .1 Fabricate signs in accordance with details, specifications and shop drawings.
- .2 Build units square, true, accurate to size, free from visual or performance defects.
- .3 Exposed fasteners as approved by Construction Manager and to be inconspicuous and same finish and colour as base material, or as noted.

Part 3 Execution

3.1 INSTALLATION

- .1 Erect and secure signs plumb and level at elevations indicated and as directed by Construction Manager.
- .2 Comply with sign manufacturer's installation instructions and approved shop drawings.

3.2 CLEANING

- .1 Leave signs clean. Remove debris from interior of sign boxes.
- .2 Touch up any damaged finishes.

END OF SECTION

Part 1 General

1.1 DESIGN CRITERIA

- .1 Furnish, deliver and install all Metal Toilet Partitions, Urinal Screens as indicated on the drawings and as required by actual conditions of the building. The Metal Toilet Partitions, , Urinal Screens will include the furnishing of all necessary screws, special screws, bolts, special bolts, expansion shields and all other devices necessary for the proper installation and application of the Metal Toilet Partitions.

1.2 REFERENCES

- .1 All Metal Toilet Partitions, Urinal Screens must be scheduled, supplied and install in accordance with: Local Building Code, CGSB (Canadian Government Specifications Board), CSA (Canadian Standards Association), and ANSI (American National Standards Institute). In all cases the above references shall be taken to mean the latest edition of that particular standard including all revisions.
- .2 CAN/CSA-B651-04(R2010), Barrier-Free Design.

1.3 SHOP DRAWINGS

- .1 Submit shop drawings in accordance with Section 01 33 00 - Submittals.
- .2 Indicate fabrication details, plans, elevations, hardware, and installation details.
- .3 Coordinate with Division 5 metals for structural support.

1.4 SAMPLES

- .1 Submit samples in accordance with Section 01 30 00 - Submittals.
- .2 Submit duplicate 300 x 300 mm samples of panel showing finished edge and corner construction and core construction.
- .3 Submit duplicate representative samples of each hardware item, including brackets, fastenings and trim.

Part 2 Products

2.1 MATERIALS

- .1 Metal toilet partitions and urinal screens: floor mounted overhead braced, colour as selected by Construction Manager from manufacturer's standard colour range.
 - .1 Acceptable materials: Shanahan's OB and Hadrian Academy.
- .2 Panels and Doors shall be constructed of two sheets of Galvanneal Zinc coated tension levelled steel sheet as to ASTM A653 ZF 75, pressure glue bonded to honeycomb core. Formed and finished with a double-edged self-locking edge, corners mitred - welded and ground smooth. Core construction shall consist of resin impregnated Kraft paper weighing a minimum of 26lb/1000 sq.ft., 32mm (1 ¼") cell size with compressive strength of 12 p.s.i. All edges shall have a recess for extra strength and flush appearance.
- .3 Pilasters shall be 32mm (1 ¼") thick with sheets not less than 0.9mm (20ga.). Manufactured in the same manner as Panels. Bottom of pilaster shall have a 12 GA. Steel Support bracket welded to pilaster.
- .4 Headrails: stainless steel with anti-grip profile.
- .4 Site Barrier: all panels and pilasters shall be fastened with full length U channels. All doors shall have a full length door stop and a visual barrier at the hinge side. Wherever a panel or pilaster comes in contact with another pilaster or panel there shall be no visible site through the joint.

2.2 COMPONENTS

- .1 All hardware, to be stainless steel.
- .2 Coat Hook/Bumper: Each door to be fitted with a combined coat hook/bumper. The combined stop and keeper to have a 19mm (3/4") diameter bumper locked in place.

- .3 Door Latch/Strike: Each door is to have a concealed door latch, vandal-proof with a slotted cover plate, for emergency entrance complete with a combination doorstop and keeper. The cover plate shall include a sliding indicator that will show red when the latch is in the locked position and show green when the latch is in the open position. The Combination doorstop and keeper shall have a slotted hole for the latch bolt and have a continuous rubber stop. The latch shall have a mechanism that allows opening and closing without grasping or twisting, making this latch acceptable for both standard and barrier free partitions.
- .4 Hinges:
 - .1 Upper door hinge shall be inset into the edge of the door, for extra strength and flush appearance. Hinge includes a 9.5mm (3/8") cold rolled steel threaded barrel to secure top hinge to door within the place of the door to create a three point support for the pin. Plastic pins are not acceptable.
 - .2 Lower door hinge shall have a gravity function and be adjustable for any open position, designed for easy installation and trouble free maintenance.
- .5 Wall brackets (stainless steel) or U Channels (Paint finish to match) shall be secured to walls with anchoring and or expansion shields. Wall brackets shall be adjustable for any vertical position.

2.3 FINISHES

- .1 All steel surfaces shall be thoroughly cleaned in automatic wash process and undercoated with an iron phosphate treatment utilizing a 5 stage wash and etching process. The paint finish being abrasion resistance to ASTM D3363 4H rating.
- .2 Colour selected from manufacturer's standard colours as approved by Construction Manager.

Part 3 Execution

3.1 SITE PREPERATION

- .1 Install necessary blocking as indicated on the manufacturers approved shop drawings.
- .2 Examine all site conditions that would prevent the proper application and installation of Metal Toilet/Urinal Partitions. Any deviation from approved shop drawings must be identified and corrected, prior to installation of the Metal Toilet/Urinal Partitions.

3.2 INSTALLATION

- .1 Ensure supplementary anchorage, if required, is in place.
- .2 Do work in accordance with CAN/CSA-B651.

3.3 ERECTION

- .1 Partition erection.
 - .1 Install partitions secure, plumb and square.
 - .2 Leave 12 mm space between wall and panel or end pilaster.
 - .3 Anchor mounting brackets to masonry/concrete surfaces using screws and shields: to hollow walls using bolts and toggle type anchors, to steel supports with bolts in threaded holes.
 - .4 Attach panel and pilaster to brackets with through type sleeve bolt and nut.
 - .5 Provide for adjustment of ceiling variations with screw jack through steel saddles made integral with pilaster. Conceal ceiling fixings with stainless steel shoes.
 - .6 Provide templates for locating threaded studs through finished ceilings.
 - .7 Equip each door with hinges, latch set, and each stall with coat hook mounted on door, mounting heights 1500 mm (1300 mm at accessible stall). Adjust and align hardware for easy, proper function. Set door open position at 30° to front Install door bumper door mounting, type.
 - .8 Equip outswinging doors with door pulls on inside and outside of door in accordance with CAN/CSA-B651.
 - .9 Install hardware grab bars.

- .2 Floor supported and overhead braced partition erection.
 - .1 Attach pilasters to floor with pilaster supports and level, plumb, and tighten installation with levelling device.
 - .2 Secure pilaster shoes in position.
 - .3 Secure headrail to pilaster face with not less than two fasteners per face.
 - .4 Set tops of doors parallel with overhead brace when doors are in closed position.

END OF SECTION

Part 1 General

1.1 REFERENCES

- .1 ASTM International
 - .1 ASTM A90/A90M-09, Standard Test Method for Weight [Mass] of Coating on Iron and Steel Articles with Zinc or Zinc-Alloy Coatings.
 - .2 A653/A653M-10, Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.
 - .3 ASTM A123/A123M-09, Standard Specification for Zinc (Hot Dip Galvanized) coatings on Iron and Steel Products.
- .2 Canada Green Building Council (CaGBC)
 - .1 LEED Canada-NC Version 1.0-[2004], LEED (Leadership in Energy and Environmental Design): Green Building Rating System Reference Package For New Construction and Major Renovations (including Addendum [2007]).
- .3 Canadian General Standards Board (CGSB)
 - .1 CAN/CGSB-138.1-96, Fabric for Chain Link Fence.
 - .2 CAN/CGSB-138.2-96, Steel Framework for Chain Link Fence.
 - .3 CAN/CGSB-138.3-96, Installation of Chain Link Fence.
 - .4 CAN/CGSB-138.4-96, Gates for Chain Link Fence.
 - .5 CAN/CGSB-1.181-99, Ready-Mixed Organic Zinc-Rich Coating.

1.2 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Submit in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Product Data: Submit manufacturer's instructions, printed product literature and data sheets for, partitions, posts and gates and include product characteristics, performance criteria, physical size, finish and limitations.
- .3 Shop drawings: Provide details of posts, chain link, anchorage materials and accessories.
 - .1 Include system installation drawings showing layout of posts, fabric, gates, anchoring and accessories.
- .4 Sustainable Design Submittals:
 - .1 LEED Canada-NC Version 1.0 Submittals: in accordance with Section 01 47 15 LEED Requirements.

1.3 DELIVERY, STORAGE AND HANDLING

- .1 Deliver, store and handle materials in accordance with Section 01 61 00 - Common Product Requirements] [and] [with manufacturer's written instructions.
- .2 Delivery and Acceptance Requirements: deliver materials to site in original factory packaging, labelled with manufacturer's name and address.
- .3 Storage and Handling Requirements:
 - .1 Store materials in accordance with manufacturer's recommendations.
 - .2 Store and protect fence and gate materials from damage.
 - .3 Replace defective or damaged materials with new.

Part 2 Products

2.1 MATERIALS

- .1 Chain-link partition fabric: to CAN/CGSB-138.1.
 - .1 Type heavy style.
 - .2 Height of fabric: as indicated.
- .2 Posts, braces and rails: to CAN/CGSB-138.2, galvanized steel pipe. Dimensions as indicated.
- .3 Top and bottom tension wire: to CAN/CGSB-138.2, galvanized steel wire.
- .4 Tie wire fasteners: steel wire.
- .5 Tension bar: to ASTM A653/A653M, 5 x 20 mm minimum galvanized steel.
- .6 Gates: to CAN/CGSB-138.4].
- .7 Gate frames: to ASTM A53/A53M, galvanized steel pipe.

- .1 Fabricate gates as indicated with electrically welded joints, and hot-dip galvanized after welding. Fasten fence fabric to gate with twisted selvage at top.
- .2 Furnish gates with galvanized malleable iron hinges, latch and latch catch with provision for padlock which can be attached and operated from either side of installed gate.
- .8 Fittings and hardware: to CAN/CGSB-138.2, galvanized steel.
 - .1 Tension bar bands: galvanized steel.
 - .2 Post caps to provide waterproof fit, to fasten securely over posts and to carry top rail.
 - .3 Turnbuckles to be drop forged.
- .9 Organic zinc rich coating: to CAN/CGSB-1.181.

2.2 FINISHES

- .1 Galvanizing:
 - .1 For chain link fabric: to CAN/CGSB-138.1 Grade 2.
 - .2 For pipe: 550 g/m² minimum to ASTM A90.
 - .3 For other fittings: to ASTM A123/A123M.

Part 3 Execution

3.1 ERECTION OF FENCE

- .1 Erect fence as indicated and to CAN/CGSB-138.3.
- .2 Securely fasten posts to concrete floor
- .3 Install end posts at end of fence.
 - .1 Install gate posts on both sides of gate openings.
- .4 Install bracing as required.
- .5 Install top rail between posts and fasten securely to posts and secure caps .
- .6 Install bottom tension wire, stretch tightly and fasten securely to end, corner, gate and straining posts with turnbuckles and tension bar bands.
- .7 Lay out partition fabric. Stretch tightly to tension recommended by manufacturer and fasten to end, corner, gate and straining posts with tension bar secured to post with tension bar bands spaced at 300 mm intervals.
 - .1 Knuckled selvedge at bottom.
 - .2 Twisted selvedge at top.
- .8 Secure fabric to top rails, line posts and bottom tension wire with tie wires at 450 mm intervals.
 - .1 Give tie wires minimum two twists.
- .9 Install grounding rods as indicated.

3.2 INSTALLATION OF GATES

- .1 Install gates in locations as indicated.
- .2 Install gate stops where indicated.

3.3 TOUCH UP

- .1 Clean damaged surfaces with wire brush removing loose and cracked coatings. Apply two coats of organic zinc-rich paint to damaged areas. Pre-treat damaged surfaces according to manufacturers' instructions for zinc-rich paint.

3.4 CLEANING

- .1 Progress Cleaning: clean in accordance with Section 01 74 11 - Cleaning.
 - .1 Leave Work area clean at end of each day.
- .2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 74 11 - Cleaning.
- .3 Waste Management: separate waste materials for reuse and recycling in accordance with Section 01 74 19 - Construction/Demolition Waste Management and Disposal, 01 47 15 - LEED Requirements.

END OF SECTION

Part 1 General

1.1 REFERENCES

- .1 American Society for Testing and Materials International (ASTM)
 - .1 ASTM E90-09, Standard Test Method for Laboratory Measurement of Airborne Sound Transmission Loss of Building Partitions and Elements.
 - .2 ASTM E557- 00(2006)e1 Standard Guide for The Installation of Operable Partitions
- .2 Underwriters Laboratories' of Canada (ULC)
 - .1 CAN/ULC-S102-03, Method of Test for Surface Burning Characteristics of Building Materials and Assemblies.

1.2 DESIGN REQUIREMENTS

- .1 Design and fabricate folding partitions with minimum STC 54 rating.
- .2 Preparation of the opening shall conform to the criteria set forth per ASTM E557 Standard Practice for Architectural Application and Installation of Operable Partitions.
- .3 Use vinyl fabric for covering with maximum:
 - .1 Flame spread -25;
 - .2 Fuel contributed -35;
 - .3 Smoke developed -50; when tested to CAN/ULC-S102.

1.3 SUBMITTALS

- .1 Provide submittals in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Product Data: Submit manufacturer's printed product literature, specifications and datasheet and include product characteristics, performance criteria, physical size, finish and limitations.
- .3 Shop Drawings:
 - .1 Submit drawings stamped and signed by professional engineer registered or licensed in Province of Manitoba, Canada.
 - .2 Show location and extent of operable partitions. Include plans, elevations, sections, details, attachments to other construction, and accessories. Indicate dimensions, weights, conditions at openings, and at storage areas, and required installation, storage, and operating clearances. Indicate location and installation requirements for hardware and track, including floor tolerances required and direction of travel. Indicate blocking.
 - .3 Show imbedded items and cut-outs required in other work, including support beam punching template.
 - .4 Submit duplicate 300 x 300 mm samples of partition finish for each colour /type of material selected.
- .4 Close-out Submittals: Provide operation and maintenance data for folding panel partitions for incorporation into manual specified in Section 01 00 02.

1.4 QUALITY ASSURANCE

- .1 Installer Qualifications: An experienced installer who is certified in writing by the operable partition manufacturer, as qualified to install the manufacturer's partition systems in material, design, and extent to that indicated for work similar to this project.

1.5 DELIVERY STORAGE AND HANDLING

- .1 Clearly mark packages and panels with numbering systems used on Shop Drawings. Do not use permanent markings on panels.
- .2 Protect panels during delivery, storage, and handling to comply with manufacturer's direction and as required to prevent damage.

1.6 WARRANTY

- .1 The manufacturer will provide a written and signed document to the owner certifying that any components with manufacturing defects will be repaired or replaced for a period of 2 years from the date of acceptance.

Part 2 Products

2.1 MANUFACTURER

- .1 Moderco S700 Series 741 manually operated accordion folding partition paired configuration in manufacturer's stand widths.
- .2 Panel to STC 54.
- .3 Full face panels no exposed trim
- .4 Interlocking vertical seals
- .5 Horizontal top seal
- .6 Automatic bottom seal

2.2 PANEL FINISHES

- .1 Reinforced heavy-duty vinyl with woven backing.
- .2 Colour: as selected by Construction Manager from manufacture's standard range.

2.3 SUSPENSION SYSTEM

- .1 Suspension Tracks #33 System.

2.4 STRUCTURAL SUPPORT FOR SUSPENSION SYSTEM

- .1 Manufacturer of partition to submit stamped shop drawings for support of suspension system and partition. Unistrut or other similar support system would be acceptable. Coordinate support system with other related work for interferences.

Part 3 Execution

3.1 MANUFACTURER'S INSTRUCTIONS

- .1 Compliance: comply with manufacturer's written recommendations or specifications, including product technical bulletins, handling, storage and installation instructions, datasheets drawings and approved Shop Drawings.
- .2 Comply with ASTM E557.

3.2 INSTALLATION

- .1 Secure and level track.
- .2 Install folding partitions in accordance with manufacturer's printed instructions.
- .3 Touch up damaged finishes, repair damage to partitions to match original finish.
- .4 Clean folding partition system and protect from damage.
- .5 Adjust and leave partitions in smooth operating condition.

3.3 CLEANING

- .1 Proceed in accordance with Section 01 74 11 - Cleaning.
- .2 On completion and verification of performance of installation, remove surplus materials, excess materials, rubbish, tools and equipment.

- 3.4**
- .1 **DEMONSTRATION**
Demonstrate proper operation and maintenance

END OF SECTION

Part 1 General

1.1 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Submit submittals in accordance with 01 33 00.
- .2 Product Data: Submit manufacturer's printed product literature, specifications and data sheets.
- .3 Shop Drawings: Indicate, by large scale details, materials, finishes, dimensions, anchorage and assembly.
- .4 Samples: Submit duplicate samples of profiles and colours for handrails.
- .5 Manufacturer's Instructions: Submit manufacturer's installation instructions.

Part 2 Products

2.1 MATERIALS

- .1 Corner Guards
 - .1 18 ga. stainless steel, no 4. Brushed finish.
 - .2 Size: 63 x 63 x 1200 mm
 - .3 Manufacturer: frost 117

Part 3 Execution

3.1 MANUFACTURER'S INSTRUCTIONS

- .1 Compliance: comply with manufacturer's written data, including product technical bulletins, product catalogue installation instructions, and data sheets.

3.2 INSTALLATION

- .1 Install protection products on solid backing and erect with materials and components straight, tight and in alignment to manufacturer's instructions.
- .2 Blocking/supports, protection products to be adhered to manufacturer's instructions.

3.3 CLEANING

- .1 Perform cleaning after installation to remove construction and accumulated environmental dirt.
- .2 Clean surfaces after installation using manufacturer's recommended cleaning procedures.
- .3 Upon completion of installation, remove surplus materials, rubbish, tools and equipment barriers.

END OF SECTION

Part 1 General

1.1 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Submit submittals in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Shop drawings: Indicate size and description of components, base material, surface finish inside and out, hardware and locks, attachment devices, description of rough-in-frame, building-in details of anchors for grab bars.
- .3 Submit samples.
- .4 Samples to be returned for inclusion into work.
- .5 Provide maintenance data for toilet and bath accessories for incorporation into manual specified in Section 01 00 02.

1.2 EXTRA MATERIALS

- .1 Provide special tools required for accessing, assembly/disassembly or removal for toilet and bath accessories in accordance with requirements specified in Section 01 00 02.
- .2 Deliver special tools to Construction Manager.

Part 2 Products

2.1 MATERIALS

- .1 Sheet steel: to ASTM A653/A653M with ZF001 designation zinc coating.
- .2 Stainless steel sheet metal: to ASTM A167.
- .3 Fasteners: concealed screws and bolts hot dip galvanized, exposed fasteners to match face of unit. Expansion shields fibre, lead or rubber as recommended by accessory manufacturer for component and its intended use.

2.2 COMPONENTS

- .1 Baby change table: Frost 1125
- .2 Toilet tissue dispenser: Frost 150
- .3 Mirrors 18" x 30"
- .4 Soap dispenser: Frost 707
- .5 Paper towel dispenser: Frost 101
- .6 Sanitary napkin Vendor: Frost 608-1
- .7 Sanitary napkin disposal: Frost 622
- .8 Waste receptacle: Frost 303l
- Grab Bars: 38 mm dia stainless steel satin finish with snap flange:
 - .1 24"
 - .2 36"
- .9 Hand dryer: Frost 1187
- .10 Shower rod c/w curtain and hooks: frost 1146-72SS
- .11 Shower seat: Frost 972
- .12 Soap dish: Frost 1132-S
- .13 Benches - Movable.
 - .1 Movable pedestal formed from 16 ga. Cold rolled steel tubing in a baked enamel finish.
 - .2 Maple seat edge grain maple sealed and lacquered, two piece 50 x 150
 - .3 Length of benches as indicated on drawings.

2.3 FABRICATION

- .1 Weld and grind joints of fabricated components flush and smooth. Use mechanical fasteners only where approved.
- .2 Wherever possible form exposed surfaces from one sheet of stock, free of joints.
- .3 Brake form sheet metal work with 1.5 mm radius bends.
- .4 Form surfaces flat without distortion. Maintain flat surfaces without scratches or dents.

- .5 Back paint components where contact is made with building finishes to prevent electrolysis.
- .6 Hot dip galvanize concealed ferrous metal anchors and fastening devices to CSA G164.
- .7 Shop assemble components and package complete with anchors and fittings.
- .8 Deliver inserts and rough-in frames to job site at appropriate time for building-in. Provide templates, details and instructions for building in anchors and inserts.
- .9 Provide steel anchor plates and components for installation on studding and building framing.

2.4 FINISHES

- .1 Chrome and nickel plating: to ASTM B456, satin, polished finish.
- .2 Stainless steel: type 304 and as indicated
- .3 Manufacturer's or brand names on face of units not acceptable.

Part 3 Execution

3.1 INSTALLATION

- .1 Install and secure accessories rigidly in place as follows:
 - .1 Stud walls: install steel back-plate to stud prior to plaster or drywall finish. Provide plate with threaded studs or plugs.
 - .2 Hollow masonry units or existing plaster/drywall: use toggle bolts drilled into cell/wall cavity.
 - .3 Solid masonry, marble, stone or concrete: use bolt with lead expansion sleeve set into drilled hole.
 - .4 Toilet/shower compartments: use male/female through bolts.
- .2 Install grab bars on built-in anchors provided by bar manufacturer.
- .3 Use tamper proof screws/bolts for fasteners.
- .4 Fill units with necessary supplies shortly before final acceptance of building.

3.2 SCHEDULE

- .1 Locate accessories as indicated. Exact locations determined by Construction Manager.

END OF SECTION

Part 1 General

1.1 REFERENCES

- .1 CAN/CGSB-44.40-92, Steel Clothing Locker.

1.2 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Submit submittals in accordance with Section 01 33 00.
- .2 Shop drawings: Indicate type and class of locker, thicknesses of metal, fabricating and assembly methods, assembled banks of lockers, tops, rods, hooks, shelves, bases, trim, numbering, filler panels, end/back panels, doors, handles, locking method, ventilation method and finishes.
- .3 Submit duplicate 50 x 50 mm samples of colour and finish on actual base metal.

Part 2 Products

2.1 LOCKERS

- .1 Locker Units: 18" W x 18"x 72" ; single tier; Surface mounted; sloped top with closures; equipped for padlock hasps; 100 mm metal base; provide one double pronged hook.
- .2 Locker Units: 24" W x 24"x 72"; single tier; surface mounted; sloped top with closures; equipped for padlock hasps; 100 mm metal base; provide double prong wall hooks, hat shelf, rubber bumper for each tier.
 - .1 Provide one extra hook at 1200 mm for 10 lockers as indicated.
- .3 Locker Body: Formed and flanged, with steel stiffener ribs; electrical spot welded.
- .4 Frames: Formed channel shape; welded and grounded flush, welded to body, resilient gaskets and latching for quiet operation.
- .5 Doors: Hollow sandwich construction, 30 mm thick; welded construction; channel reinforced top and bottom with intermediate stiffener ribs, acoustic insulation fill, grind and finish edges smooth.
- .6 Hinges: Two for doors under 1 050 mm high; three for doors over 1 050 mm high; weld securely to locker body and door.
- .7 Number Plates: Provide rectangular shaped aluminum plates.
- .8 Provide ventilation openings at top and bottom of each locker.
- .9 Form recess for operating handle and locking device.
- .10 Finish edges smooth without burrs.
- .11 Fabricate sloped metal tops, ends and closure pieces.
- .12 Acceptable manufacturer: Shanahan's Delux series locker.

2.2 FINISHES

- .1 Clean, degrease, and neutralize metal; prime and finished with two coats of baked enamel.
- .2 Colour: colours as selected by Construction Manager from manufacture's standard range.

Part 3 Execution

3.1 EXAMINATION

- .1 Verify that prepared bases are in correct position and configuration.
- .2 Verify bases and embedded anchors are properly sized.

3.2 INSTALLATION

- .1 Install in accordance with manufacturer's instructions.
- .2 Install locker plumb and square.
- .3 Secure lockers with anchor devices to suit substrate materials. Minimum Pullout Force: 445 N.
- .4 Bolt adjoining locker units together to provide rigid installation.
- .5 Install end panels, filler panels, sloped tops, and bases.

-
- .6 Install accessories.
 - .7 Replace components that do not operate smoothly.

3.3

CLEANING

- .1 Clean to Section 01 74 11.
- .2 Clean locker interiors and exterior surfaces.

END OF SECTION

Part 1 General

1.1 REFERENCES

- .1 Spring tempered aluminum: Aluminum Association alloy AA6011.
- .2 Aluminum extrusions: Aluminum Association alloy AA6063-T5

1.2 DESIGN REQUIREMENTS

- .1 Design roller shades to following requirements:
 - .1 Be designed in a manner that allows wear susceptible parts to be replaceable by either the user or the manufacturer.
 - .2 A guarantee of at least five-years of available replacement parts following discontinue of the products manufacture.
 - .3 Be accompanied by instructions for replacing or repairing worn parts, including inventory numbers for parts and procedures for ordering replacement parts.
 - .4 A program that allows for the refurbishing or return of used roller shades.
 - .5 Be designed in a manner that permits effective disassembly of components in order to permit recycling of materials for which recycling markets exist.
 - .6 Include stamps on all major plastic components indicating composition code to facilitate recycling efforts.

1.3 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Submit submittals in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Submit Shop drawings: Indicate dimensions in relation to window jambs, operator details, head and sill anchorage details, hardware and accessories details.
- .3 Submit one representative working sample of each type roller shade.
- .4 Submit duplicate samples of manufacturer's standard colours for selection by Construction Manager.
- .5 After approval samples will be returned for incorporation into the Work.

Part 2 Products

2.1 MATERIALS AND FABRICATION

- .1 Shade Band Material: PVC-coated fiberglass (36% Fiberglass, 64% Vinyl on Fiberglass)
- .2 Colour as selected by Construction Manager from manufacturer's full range.
- .3 Material Solar Optical Properties: Two-sided fabric for maximum performance in heat reduction, glare reduction and improved visibility.
- .4 Material Openness Factor: 5%
- .5 Material UV Blockage: 95%
- .6 Fabric thickness: Minimum 0.5mm
- .7 Shade Operation: Motorized operator
- .8 Provide fascia cover
- .9 Acceptable material: Silent Gliss 4870

Part 3 Execution

3.1 INSTALLATION

- .1 Install roller shades to manufacturer's written instructions.
- .2 Adjust to provide for operation without binding.
- .3 Adjust fabric, drive assembly to provide smooth operation and to fit tightly in closed position.

END OF SECTION

Part 1 General

1.1 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Submit submittals in accordance with Section 01 33 00.
- .2 Submit product data sheets.
- .3 Submit shop drawings.
- .4 Submit maintenance data for cleaning and maintenance of floor matt for incorporation into manual specified in Section 01 78 00.

1.2 QUALITY ASSURANCE

- .1 Flammability in accordance with ASTM E648, Class 1, Critical Radiant Flux, minimum 0.45 watts/m2.
- .2 Slip resistance in accordance with ASTM D-2047-96, Coefficient of Friction, minimum 0.60 for accessible routes.
- .3 Standard rolling load performance: 500 lb./wheel . nd minimum of 2500 passes. Load applied to a 5" diameter, 2" wide solid polyurethane wheel.
- .4 Single Source: Obtain entrance matting and frames from a single source to ensure dimensional compatibility.

Part 2 Products

2.1 MANUFACTURERS

- .1 CS G6
- .2 RG 710

2.2 MATERIALS

- .1 Aluminum - ASTM B 221, alloys 6063-T5, 6063 for extrusions.
- .2 Stainless steel – type 304.
- .3 Entrance grating: Manufactured from type 304 stainless steel V-Wire resistance welded to type 304 stainless steel fin support rails. V-Wire rails shall be .069" x .185" spaced to provide .125" opening to allow for drainage. Support fins shall be .070" x .500" to provide an overall grating height of 5/8". Support fins are spaced approximately 1" on center. Walking surface is a #3 satin finish.
- .4 Hold-Downs: 1. Grating shall be mechanically fastened to substrate using hidden stainless steel clip and fastener system. Hold-Downs shall not obstruct the walking surface.
- .5 Angle Frame: extruded type 304 stainless steel 3/4" x 3/4" angle frame. Installed frame provides 1/8" exposed perimeter trim and 5/8" deep recess. Standard in mill finish. Installer to use self-leveling screed to ensure smooth, flat recess.

Part 3 Execution

3.1 INSTALLATION

- .1 Set and firmly secure frame square and level in concrete. Top of frame and carriers shall be flush with floor finish.
- .2 Install in accordance with manufacture's written instructions.
- .3 Protect foot grill during construction.
- .4 Clean foot grill.

END OF SECTION

Part 1 General

1.1 SECTION INCLUDES

- .1 This Section includes specifications for materials and installation of standard manufactured catalogue items including: benches, picnic tables, waste containers, ash urns, and bicycle racks.

1.2 REFERENCES AND RELATED SECTIONS

- .1 Canada Green Building Council (CaGBC) LEED® Green Building Rating System – LEED® Canada-NC Version 1.
- .2 Section 01 33 00 – Submittal Procedures
- .3 Section 01 74 21 – Construction/Demolition Waste Management and Disposal
- .4 Section 01 78 00 – Closeout submittals.

1.3 SUBMITTALS

- .1 Submit product data in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Submit Shop Drawings in accordance with Section 01 33 00 - Submittal Procedures. Indicate dimensions, sizes, assemblies, anchorage and installation details for each furnishing specified.
- .3 Indicate dimensions, sizes, assembly, anchorage and installation details for each furnishing specified.
- .4 Provide maintenance data for care and cleaning of site furnishings for incorporation into manual specified in Section 01 78 00 - Closeout Submittals.

Part 2 Products

2.1 BENCHES

- .1 DuMor 185-60PL Bench, recycled plastic ("cedar" colour), powder coated metal frame ("charcoal" colour).
Surface mount: Two supports.
Dimensions: 1.83 x 0.559m.
Weight: 79 kilos.

2.2 PICNIC TABLES

- .1 DuMor 156-68-1PL Accessible Picnic Table recycled plastic ("cedar" colour), polyester powder finish metal frame ("charcoal" colour).
Surface mount: four anchor sites.
Dimensions: 2.413 x 1.498m.
Weight: 114.8 kilos.
- .2 Landscape Forms Gretchen Picnic Table- PolySite TM recycled plastic ("bark" colour), powder coated metal frame ("Stormcloud" colour powder coated metal), without umbrella hole.
Surface mount: four anchor sites.
Dimensions: 1.372 x 1.473m.
Weight: 140.6 kilos.

2.3 TRASH CONTAINERS

- .1 DuMor 84-22-FTO, 22 gallon all steel Receptacle, polyester powder coated metal ("charcoal" colour).
Surface mount: three anchor sites.
Dimensions: 0.686m diam (top), 0.432m diam (base)
Weight: 68.04 kilos.

2.4 ASH URNS

- .1 DuMor 423-00 all steel ash urn side mount, polyester powder coated metal ("charcoal" colour). Ash receiver 0.006 steel with 10ga aluminum plate.
Mount to each trash container.
Dimensions: 0.686m diam (top), 0.432m diam (base)
Weight: 10.4 kilos.

2.5 BICYCLE RACKS

- .1 Urban Park Belle Isle Series Bicycle Rack, 8 bicycle capacity, galvanized steel.
Embed in thickened slab.
Dimensions: 1.7m wide x 0.686m deep.
- .2 Urban Park Belle Isle Series Bicycle Rack, 6 bicycle capacity
Embed in thickened slab.
Dimensions: 1.3m wide x 0.686 deep.

Part 3 Execution

3.1 INSTALLATION

- .1 Assemble furnishings in accordance with manufacturer's instructions.
- .2 Install furnishings true, plumb, anchored to hard surfacing.
- .3 Use SS epoxy grouted anchors where applicable.
- .4 Touch-up damaged finishes.

END OF SECTION

PART 1 GENERAL

1.1 SUMMARY

- .1 Work Required:
- .1 The work required under this section consists of all labour, materials and services required for the complete installation (including operational verification) of all the equipment required for the elevator as herein specified.
 - .2 In all cases where a device or part of the equipment is herein referred to in the singular, it is intended that such reference shall apply to as many of such devices or parts as are required to make complete installation.

1.2 REFERENCES

- .1 American National Standards Institute (ANSI).
 - .1 ANSI/NEMA MG 1-2003, Motors and Generators.
- .2 Canadian Standards Association (CSA International).
 - .1 CSA-B44-04, Safety Code for Elevators.
 - .2 CAN/CSA-B651-04, Accessible Design for the Built Environment.
 - .3 CAN/CSA C22.1-06, Canadian Electrical Code
- .3 National Building Code (NBC).
 - .1 National Building Code of Canada 2010.

1.3 SYSTEM DESCRIPTION

- .1 Type: Twin direct acting hydraulic cylinder without well holes
 - .1 Elevator Stop Designations: Level 1 and Level 2.
 - .2 Stops: each floor.
 - .3 Number of openings: each floor at front only
 - .4 Rated capacity/speed: 3500 pounds, 100 fpm.
Minimum Car Inside: Front Opening :
2032 mm x 1651 mm
 - .5 Clear height Car ceiling: 2438 mm
 - .6 Height under ceiling: 2235 mm
 - .7 Entrance type and width: Single-Slide Doors 1143 mm x 2134 mm
 - .8 Main Power Supply: 600 Volts, 3 Phase, with a separate equipment grounding conductor.
 - .9 Lighting Power Supply: 120 Volts, 1 Phase, 15 Amp, 60 Hz.
 - .10 Stopping Accuracy: ± 6.4 mm under any loading condition or direction of travel.
 - .11 Door opening: left hand.
- .2 Simplex Collective Operation: Using a microprocessor-based controller, operation shall be automatic by means of the car and hall buttons. If all calls in the system have been answered, the car shall park at the last landing served.
- .3 Provide microprocessor-based control system with utilizes on-board diagnostics for servicing, trouble-shooting, and adjusting without requiring the use of an outside service tool. If an on-board diagnostic system is not provided, a handheld service tool (or laptop), owner's license, operation manual, and tool instructions must be provided in addition to the control system.
- .4 Car Operating Features
 - .1 Full Collective Operation.
 - .2 Single Speed Fan.
 - .3 On/Off Light Switch.
 - .4 Solid State Starting
 - .5 Remote elevator monitoring REM® ready.
 - .6 Car-Stall Protection.
 - .7 Special Emergency Service Phase I and II - Emergency Recall
 - .8 Top of Car Inspection.

- .5 Door Control Features:
1. Closed Loop Door Operator is a closed loop, microprocessor based door operator system. The door operator will facilitate smooth operation under varying environmental influences such as, temperature, wind, friction, and component variation. The processor will monitor the door's actual position and velocity compared to its desired position and velocity. If variations are detected in the profile the command will be automatically corrected. The Closed Loop Door Operator control system shall not require machine room door control equipment.
 2. Door noise not to exceed 58dBA.
 3. Door control to open doors automatically when car arrives at a landing in response to a normal hall or car call.
 4. Door control to open doors automatically when car arrives at a landing in response to a normal hall or car call.
 Elevator doors shall be provided with a reopening device that will stop and reopen the car door(s) and hoistway door(s) automatically should the door(s) become obstructed by an object or person.
 Primary door protection shall consist of a two dimensional, multi-beam array projecting across the car door opening. Under normal operation and for any door position, the system shall detect as a blockage an opaque object that is equal to or greater than 1.3 inches (33 mm) in diameter when inserted between the car doors at vertical positions from within 1 inch (25 mm) above the sill to 71 inches (1800 mm) above the sill. Under degraded conditions (one or more blocked or failed beams), the primary protection shall detect opaque objects that are equal to or greater than 4" (100 mm) in diameter for the same vertical coverage. If the system performance is degraded to the point that the 4" object cannot be detected, the system shall maintain the doors open or permit closing only under nudging force conditions.
 The door reopening device shall also include a secondary, three dimensional, triangular infrared multi-beam array projecting across the door opening and extending into the hoistway door zone. The door opening device will cause the doors to reopen when it detects a person(s) or object(s) entering or exiting the car in the area between the hoistway doors or the entryway area adjacent to the hoistway doors.
 The size of the secondary protection zone shall vary as the door positions vary during opening and closing. The width of the zone shall be approximately one-third the size of the separation between the doors (or door and strike plate for single-slide doors) and shall be approximately centered in the door separation. In order to minimize detection of hallway passers-by who are not entering the elevator, the maximum zone penetration into the entryway shall not exceed 20" for any door separation. Normal penetration depth into the entryway from the car doors shall be ~14" for a door separation of 42". The penetration shall reduce proportionally as the doors close. At door separations of 18" or less the secondary protection system may cease its normal operation since the depth of the zone recedes to where it is inside the hoistway doors.
 The vertical coverage of the secondary protection shall be ~19" (480 mm) above the sill to ~55" (1400 mm) above the sill (mid-thigh to shoulder of a typical adult).
 The secondary protection shall have an anti-nuisance feature which will ignore detection in the secondary zone after continual detection occurs for a significant time period in the secondary zone without corresponding detection in the primary protection zone; i.e. a person/object is in the entryway but does not enter. Normal secondary protection shall be re-enabled whenever a detection occurs in the primary zone.
 The reaction time of the door detector sub-system shall not exceed 60 milliseconds when both primary and secondary protection capabilities are active; nor 40 milliseconds when the secondary protection is disabled.
 5. Door nudging operation to occur if doors are prevented from closing for an adjustable period of time.
- .6 Provide equipment according to Seismic zone: 0
- .7 Provide equipment according to seismic data NBC 2010.
- .8 Design and construct elevator in accordance with CSA-B44, local codes and regulations and to meet City of Winnipeg Accessibility design standards.

1.4 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Submit submittals in accordance with Section 01 33 00.
- .2 Product Data: submit manufacturer's printed product literature, specifications and data sheet. Include the following:
 - .1 Signal and operating fixtures, operating panels and indicators.
 - .2 Cab design, dimensions and layout.
 - .3 Hoistway-door and frame details.
 - .4 Electrical characteristics and connection requirements.
 - .5 Expected heat dissipation of elevator equipment in machine room (BTU).
 - .6 Color selection chart for Cab and Entrances.
- .3 Shop Drawings: Submit shop drawings to indicate project layout, including details and the following information:
 - .1 Car, guide rails, buffers and other components in hoistway.
 - .2 Maximum rail bracket spacing.
 - .3 Maximum loads imposed on guide rails requiring load transfer to building structure.
 - .4 Loads on hoisting beams
 - .5 Clearances and travel of car.
 - .6 Clear inside hoistway and pit dimensions.
 - .7 Location and sizes of access doors, hoistway entrances and frames.
 - .8 Equipment arrangement in the machine room/control space, pit and hoistway.
 - .9 Shop drawings submitted stamp by qualified professional engineer registered in Canada.
- .4 Samples: Submit samples, complete with colour schemes, illustrating: floor material, car interior, car ceiling, car door, hoistway entrance door and frame finishes.
- .5 Certificates: submit certificates signed by manufacturer certifying that materials comply with specified performance characteristics and physical properties.
- .4 Instructions: submit manufacturer's installation instructions.
- .5 Manufacturers Field Services: submit copies of manufacturers field reports.
- .6 Closeout Submittals:
 - .1 Submit the following in accordance with Section 01 33 00.
 - .2 Project Record Documents:
 - .1 Record actual locations of equipment, names of equipment manufacturers and suppliers, concealed conduit and boxes, concealed devices, disconnects.
 - .3 Operation and Maintenance Data:
 - .1 Include description of elevator system's method of operation and control including, motor control system, door operation, signals, firefighter's service, emergency power operation, and special or non-standard features provided.
 - .2 Provide parts catalogues with complete list of equipment replacement parts with equipment description and identifying numbers.
 - .3 Legible schematic wiring diagrams covering electrical equipment installed, including changes made in final work, with symbols listed corresponding to identity or markings.
 - .4 Instruct Owner in maintenance of special finishes.

1.5 QUALITY ASSURANCE

- .1 Qualifications:
 - .1 Installer Qualifications: company or person experienced in performing work of this section specializing in installation of work similar to that required for this project, with minimum five years documented experience and approved by elevator systems manufacturer.
 - .2 Permits, Inspections and Certificates: The Elevator Contractor shall obtain and pay for necessary Municipal Inspection and permit as required by the elevator inspection authority, and make such tests as are called for by the regulations or such authorities. These tests shall be made in the presence of such authorities or their authorized representatives.

1.6 DELIVERY, STORAGE AND HANDLING

- .1 Deliver, store and handle components in accordance with Section 01 60 00 and in accordance with manufacturer's written instructions.
- .2 Packing, Shipping, Handling and Unloading: Deliver materials in manufacturer's original, unopened, undamaged containers with identification labels intact.
- .3 Storage and Protection: Store materials protected from exposure to harmful weather conditions and at temperature conditions recommended by manufacturer.

1.7 WARRANTY

- .1 Manufacturers Warranty: submit, for Consultant's acceptance, manufacturer's standard warranty document executed by authorized company official.

1.8 MAINTENANCE SERVICE

- .1 Maintenance service consisting of regular examinations, adjustments and lubrication of the elevator equipment shall be provided by the elevator contractor for a period of (12) twelve months after the elevator has been turned over for the owner's use.
- .1 Systematically; examine, clean, adjust, and lubricate equipment as per planned maintenance tasks and frequencies.
- .2 Maintenance to include systematic examination, adjustment and lubrication of elevator equipment; repair or replace parts whenever required. Use genuine parts produced by the manufacturer of specific equipment.
- .3 Perform work without removing cars during peak traffic periods.
- .4 Provide emergency call back service at all hours for this maintenance period.
- .5 Maintain locally, near place of work, an adequate stock of parts for replacement or emergency purposes and have qualified installation personnel available to ensure fulfillment of this maintenance service without unreasonable loss of time.
- .6 Perform maintenance work using competent personnel, under supervision and in direct employ of elevator manufacturer.
- .7 Do not assign or transfer maintenance service to any agent or subcontractor without prior written consent of Consultant.

PART 2 PRODUCTS

2.1 ACCEPTABLE MANUFACTURER

- .1 OTIS LVM 3500L

2.2 EQUIPMENT MACHINE ROOM COMPONENTS

- .1 The hydraulic system shall be of compact design suitable for operation under the required pressure. The power component shall be mounted in the hydraulic-fluid storage tank. The control valve shall control flow for up and down directions hydraulically and shall include an integral check valve. A control section including control solenoids shall direct the main valve and control: up and down starting, acceleration, transition from full speed to leveling speed, up and down stops, pressure relief and manual lowering. All of these functions shall be fully adjustable for maximum smoothness and to meet contract conditions. System to be provided with a low-pressure switch and a shut-off valve.
- .2 A microprocessor-based controller shall be provided, including necessary starting switches together with all relays, switches, solid-state components and hardware required for operation, including door operation, as described herein. A three (3) phase overload device shall be provided to protect the motor against overloading.
- .3 A manual lowering feature shall permit lowering the elevator at slow speed in the event of power failure or for adjusting purposes.

2.3 EQUIPMENT: HOISTWAY COMPONENTS

- .1 Plunger(s) and Cylinder(s): Each cylinder shall be constructed of steel pipe of sufficient thickness and suitable for the operating pressure. The top of each cylinder shall be equipped with a cylinder head with a drip ring to collect any oil seepage as well as an internal guide ring and self-adjusting packing. Each plunger shall be constructed of selected steel tubing or pipe of proper diameter machined true and smooth with a fine polished finish. Each plunger shall be provided with a stop ring electrically welded to it to prevent the plunger from leaving the cylinder. Each plunger and cylinder shall be installed plumb and shall operate freely with minimum friction.
- .2 Car Guide Rails: Tee-section steel rails with brackets and fasteners.
- .3 Spring Buffer: Helical coil spring type.
- .4 Wiring: Wiring for hoistway electrical devices included in scope of the elevator system, hall panels, pit emergency stop switch, and the traveling cable for the elevator car.
- .5 Hoistway Entrances
 - 1. Frames: Entrance frames shall be of bolted construction for complete one-piece unit assembly. All frames shall be securely fastened to fixing angles mounted in the hoistway and shall be UL fire rated steel. Sills shall be extruded aluminum.
 - 2. Doors: Entrance doors shall be of metal construction with vertical channel reinforcements.
 - 3. Fire Rating: Entrance and doors shall have a UL 1-1/2 hour fire protection rating.
 - 4. Entrance Finish: Baked Enamel. Color to be selected from the manufacturer's standard color chart.
 - 5. Entrance Markings: Entrance jambs shall be marked with 4" x 4" (102 mm x 102 mm) plates having raised floor markings with Braille adjacent. Markings shall be provided on both sides of the entrance.
 - 6. Sight Guards: Black sight guards will be furnished.

2.4 EQUIPMENT: CAR COMPONENTS

- .1 Car frame: A suitable car frame shall be provided with adequate bracing to support the platform and car enclosure. The buffer striking plate on the underside of the car-frame platform assembly must fully compress the spring buffer mounted in the pit before the plunger reaches its lower limit of travel.
- .2 Platform, Heavy Loading Type: The car platform shall be arranged to accommodate one-piece loads weighing up to 25% of the rated capacity, such as wheeled food carts, stretchers, x-ray equipment, etc. The platform shall be recessed 8 mm for flooring by others.
- .3 Steel Cab: cab walls to be plastic laminate finish.
- .4 Car Front Finish: satin stainless steel.
- .5 Car Door Finish: satin stainless steel.
- .6 Car Top: to be of wood material clad on both sides with a natural finish aluminum panel.
- .7 Ceiling Type: Aluminum Egg crate (DC22E Ceiling) suspended ceiling shall consist of aluminum egg crate diffusers set in frame of extruded aluminum with fluorescent lighting fixtures.
- .8 Emergency Car Lighting: An emergency power unit employing a 6-volt sealed rechargeable battery and totally static circuits shall be provided to illuminate the elevator car and provide current to the alarm bell in the event of building power failure.
- .9 Emergency Pulsating Siren: Siren mounted on top of the car that is activated when the Alarm button in the car operating panel is engaged. Siren shall have a rated sound pressure level of 80 dB(A) at a distance of 3.0 m from the device. Siren shall respond with a delay of not more than 1 second after the switch or push button has been pressed.
- .10 Exhaust Fan: To be mounted on the car top.
- .11 Utility Outlet: A 125V 15 amperes utility outlet with ground-fault circuit-interrupter protection shall be furnished on top of the cab.
- .12 Handrail: (DH-50) Handrails shall be provided on the side and rear walls of the car enclosure. Handrails shall be 13 mm x 38 mm flat tubular handrail with a satin stainless steel finish.
- .13 Threshold: nickel silver.
- .14 Emergency Exit Contact: An electrical contact shall be provided on the car-top exit.

2.5 EQUIPMENT: SIGNAL DEVICES AND FIXTURES

- .1 Car Operating Panel: A car operating panel shall be provided which contains all push buttons, key switches, and message indicators for elevator operation. The car operating panel shall have a satin stainless steel finish.
- .2 Fixtures: Hinged swing car operating panel shall be furnished. It shall contain a bank of round metal mechanical illuminated buttons. Flush mounted to the panel and marked to correspond to the landings served, an emergency call button, door open and door close buttons, and switches for lights, inspection and the exhaust fan. The emergency call button shall be connected to a bell that serves as an emergency signal. All buttons to have raised numerals and Braille markings. LED red halo illumination with 3 mm projecting targets. Target finishes: satin stainless steel.
- .3 The car operating panel shall be equipped with the following features:
 - .1 Raised markings and Braille shall be provided to the left hand side of each push-button.
 - .2 Car Position Indicator at the top of and integral to the car operating panel.
 - .3 Door open and door close buttons.
 - .4 Light key-switch.
 - .5 Fan key-switch.
 - .6 Inspection key-switch.
 - .7 Elevator Data Plate marked with elevator capacity and car number.
 - .8 Illuminated alarm button with raised markings.
 - .9 In car stop switch (toggle or key unless local code prohibits use)
 - .10 Firefighter's hat
 - .11 Firefighter's Phase II Key-switch
 - .12 Call Cancel Button
- .4 Car Position Indicator: A 16-segment, digital, vacuum fluorescent car position indicator shall be integral to the car operating panel.
- .5 Hall Fixtures: Hall fixtures shall be provided with necessary push buttons and key switches for elevator operation.
 - .1 Hall fixtures shall feature round metal mechanical buttons marked to correspond to the landings, in raised fixture housings. Buttons shall be 3 mm projecting in vertically mounted fixture. Satin Stainless steel finish.
- .6 Car Lantern and Chime: A directional lantern visible from the corridor shall be provided in the car entrance. When the car stops and the doors are opening, the lantern shall indicate the direction in which the car is to travel and a chime will sound.
- .7 Car Lantern and Chime: A directional lantern visible from the corridor shall be provided at each hall entrance. When the car stops and the doors are opening, the lantern shall indicate the direction in which the car is to travel and a chime will sound.
- .8 A Handsfree Telephone shall be furnished in the return panel integral to the car operating panel. Necessary wires for the telephone shall be included in the elevator and connected to the car traveling cable. A telephone line terminating in the elevator controller will be provided by others. Instrument shall be furnished by others.
- .9 Access key-switch at top floor in entrance jamb.

PART 3 EXECUTION**3.1 MANUFACTURER'S INSTRUCTIONS**

- .1 Compliance: comply with manufacturer's written data, including product technical bulletins, product catalogue installation instructions, product carton installation instructions, and data sheet.

3.2 INSTALLATION

- .1 Install elevator materials and components in accordance with CSA-B44, local codes, regulations and manufacturer's written instructions.

3.3 FIELD QUALITY CONTROL

- .1 Manufacturer's Field Services:

- .1 Have manufacturer of products, supplied under this Section, review Work involved in the handling, installation/application, protection and cleaning, of its products and submit written reports, in acceptable format, to verify compliance of Work with Contract.
- .2 Provide manufacturer's field services consisting of product use recommendations and periodic site visits for inspection of product installation in accordance with manufacturer's instructions.
- .3 Schedule site visits, to review Work, at stages listed:
 - .1 After delivery and storage of products, and when preparatory Work, or other Work, on which the Work of this Section depends, is complete but before installation begins.
 - .2 Twice during progress of Work at 25% and 60% complete.
 - .3 Upon completion of the Work, after cleaning is carried out.
- .4 Obtain reports, within 3 days of review, and submit, immediately, to Consultant.

3.4 **SITE TESTS**

- .1 Perform and meet tests required by CSA-B44.
- .2 Supply instruments and execute specific tests.
- .3 Furnish test and approval certificates issued by jurisdictional authorities.
- .4 At agreed time during twelve month warranty period and with building normally occupied using normal building traffic, conduct tests to verify performance. Furnish event recording of hall call registrations, time initiated, and response time throughout entire normal working day.

3.5 **CLEANING**

- .1 Remove protective coverings from finished surfaces and components. Clean surfaces and components ready for inspection.

3.6 **ADJUSTMENTS**

- .1 Adjust door opening and closing times to suit handicapped users in accordance with Consultant instructions.
- .2 Adjust control system to cause elevators to answer hall calls during working day within performance criteria specified.
- .3 Adjust for smooth acceleration and deceleration of car as so not to cause passenger discomfort.
- .4 Adjust automatic floor levelling feature at each floor.

END OF SECTION

Part 1 General**1.1 SUMMARY OF WORK**

- .1 Section Includes:
- .1 Sustainable requirements for contractor verification.
 - .1 Submit as required in section 01 47 13 – LEED Requirements.
 - .2 Domestic Water Piping:
 - .1 Pipe Components.
 - .2 Joint and Fitting Components.
 - .3 Unions and Flanges.
 - .4 Valves.
 - .3 Fixtures:
 - .1 Hose Bibs.
 - .2 Drain Valves.
 - .3 Water Hammer Arresters.
 - .4 Equipment:
 - .1 In-Line Circulator Pumps.
 - .2 Domestic Hot Water Storage Tanks.

1.2 RELATED SECTIONS

- .1 Section 01 33 00 – Submittal Procedures.
- .2 Section 01 47 13 – LEED Requirements.
- .3 Section 01 74 11 – Cleaning.
- .4 Section 01 74 19 – Construction Waste Management and Disposal.
- .5 Section 01 78 00 – Closeout Submittals.
- .6 Section 01 91 13 – General Commissioning (Cx) Requirements.
- .7 Section 21 12 01 – Standpipe & Hose Systems.
- .8 Section 21 13 01 – Sprinkler System
- .9 Section 22 42 00 – Plumbing Fixtures.

1.3 REFERENCES

- .1 American Society of Mechanical Engineers (ASME).
 - .1 ASME B16.18-2001, Cast Copper Alloy Solder Joint Pressure Fittings.
 - .2 ASME B16.22-2001, Wrought Copper and Copper Alloy Solder Joint Pressure Fittings.
 - .3 ANSI/ASME BPVC-2007 - BPVC Section IX - Welding and Brazing Qualifications.
- .2 American Society for Testing and Materials International, (ASTM).
 - .1 ASTM B32-08, Standard Specification for Solder Metal.
 - .2 ASTM B88-09, Standard Specification for Seamless Copper Water Tube.
 - .3 ASTM B664-90(2006), Standard Specification for 80% Silver-20% Graphite Sliding Contact Material.
 - .4 ASTM C547-07e1, Standard Specification for Mineral Fiber Pipe Insulation.
 - .5 ASTM A193, Alloy-Steel and Stainless Steel Bolting Materials for High Temperature or High Pressure Service and Other Special Purpose Applications
 - .6 ASTM A312, Seamless and Welded Austenitic Stainless Steel Pipe
 - .7 ASTM A351, Castings, Austenitic, Austenitic-Ferritic (Duplex), for pressure Containing Parts
 - .8 ASTM A536, Ductile Iron Castings
 - .9 ASTM A743, Castings, Iron-Chromium Nickel, Corrosion Resistant, for General Applications
 - .10 ASTM A744, Castings, Iron-Chromium Nickel, Corrosion Resistant, for Severe Applications
- .3 American Society of Heating, Refrigeration and Air Conditioning Engineers (ASHRAE).
 - .11 ASHRAE 90.1-2007, Energy Standard for Buildings Except Low-Rise Residential Buildings.

- .3 Plumbing and Drainage Institute (PDI).
 - .1 PDI WH201-1992, Water Hammer Arrester Standard.
- .4 Manitoba Workplace Safety and Health Workplace Hazardous Materials Information System (WHMIS)
 - .1 Material Safety Data Sheets (MSDS).
- .5 National Plumbing Code of Canada 2010 as amended by the Manitoba Plumbing Code Regulation 32/2011.

1.4 DESIGN PERFORMANCE REQUIREMENTS

- .1 Design domestic hot, cold and recirculated water systems and install components in accordance with applicable regulations of the National Plumbing Code of Canada 2010 as amended by the Manitoba Plumbing Code Regulation 32/2011.
- .2 Provide metered domestic water services to plumbing fixtures and equipment.
- .3 Water Pressure at any outlet: minimum 140 kPa under flow conditions, between 300 and 500 kPa static pressure, and where static pressures exceed 500 kPa, provide pressure control valves.
- .4 Size piping and select fittings: minimum local plumbing code requirements.
- .5 Hot Water: size and select piping, equipment and insulation to ensure minimum hot water temperature of 60°C in 15 seconds or less at any domestic hot water outlet.
- .6 Provide for continuous hot water delivery at dishwasher.
- .7 Insulate hot and cold water piping to meet design temperature requirements, and to prevent condensation.
- .8 Provide adequate storage and fail-safe water mixing systems to operate eyewash stations within the requirements of ANSI-Z358.1-2009 – “Emergency Eyewash and Shower Equipment”.

1.5 SUBMITTALS

- .1 Submittals in accordance with Section 01 33 00 – Submittal Procedures.
- .2 Product Data: submit WHMIS MSDS - Material Safety Data Sheets in accordance with Section 01 47 13 – LEED Requirements. Indicate VOC's during application and curing.
- .3 Operation and Maintenance Manual: submit operational requirements and spare parts lists.

1.6 QUALITY ASSURANCE

- .1 Utilize Design and installation personnel thoroughly familiar with systems of this type.
- .2 Provide multiple units from same manufacturer.
- .3 Health and Safety:
 - .1 Do construction occupational health and safety in accordance with Manitoba Workplace Safety and Health Requirements.
- .4 COR Certification:
 - .1 All members of the Design Build Team are to be COR Certified to participate in the design, construction and commissioning.

1.7 DELIVERY, STORAGE AND HANDLING

- .1 Maintain piping and valve cleanliness by protecting open ends from entry by dust, water, debris or vermin during delivery and storage.
- .2 Material damaged in transit or during storage and handling is to be replaced prior to installations.
- .3 Material for use in potable water system shall be stored in a weather tight storage building or construction.

Part 2 Products

2.1 MATERIALS

- .1 Sustainable Requirements: Refer to Section 01 47 13 – LEED Requirements.

- .2 Pipe, Joints, and Fittings are to comply with one of the following standards:
 - .1 Copper Pipe: ASTM B 88 with ASME B16.22 wrought copper or ASME B16.18 cast copper, brass and bronze fittings, ASTM B32 solder, or ASTM B664 brazed joints.
 - .2 Stainless Steel Pipe: ASTM A312 with ASTM A351, A743, and A744 mechanical couplings and ASTM D-2000 gaskets.
- .3 Joints:
 - .1 Solder Joints: ASTM B32.
 - .2 Brazed Joints: ASTM B664.
 - .3 Mechanical Couplings: ASTM A351, A743, and A744.
- .4 Insulation: ASTM C547, with sufficient insulating value to prevent sweating on cold pipes, and maintain hot water temperature requirements at fixtures on hot pipes.
 - .1 Pipe: minimum 13 mm thick, with vapour barrier on cold pipe.
 - .2 Equipment: size and material to maintain maximum 40°C equipment surface temperature during operation.

2.2 BACKFLOW PREVENTION

- .1 Provide backflow prevention in accordance with the Manitoba Plumbing Code and the City of Winnipeg Water Works Bylaw 504/73.
- .2 Provide annual inspection and service of the backflow preventers, including testing, at the end of the one-year warranty period.

2.3 WATER METER

- .1 Install any meter provided by the City of Winnipeg Water Works Department into the main domestic water service where it enters the structure.

2.4 EMERGENCY EYEWASH AND SAFETY SHOWER

- .1 Provide and certify the eyewash and emergency shower stations in accordance with ANSI-Z358.1-2009.
- .2 Provide fail-safe thermostatic mixing valve station(s) arranged such that the water can be recirculated into the domestic hot water system and maintain potable conditions.

2.5 VALVES

- .1 Connections: screwed or soldered connections on 50 mm and smaller valves, flanged connections on valves larger than 50 mm.
- .2 Isolation Valves: type designed for tight seal in closed position, with no measurable leakage at 150% design system pressure.
- .3 Drain Valves: same as isolation valves.
- .4 Throttling Valves: type designed to smoothly throttle flow of water from 0 to full design flow capable of withstanding 150°C fluid temperature on hot piping.
- .5 Check Valves:
 - .1 Designed to prevent backflow of water as determined by plumbing code.
 - .2 Use spring loaded check valves where high upstream water pressure may prevent swing check valves from performing.

2.6 FIXTURES

- .1 Water Hammer Arresters: to PDI WH201.

2.7 DOMESTIC HOT WATER EQUIPMENT

- .1 Heat Generation:
 - .1 System: to ASHRAE 90.1.
 - .2 Heating capacity: maintain design temperature continuously with 30 minute recovery time.

- .3 Storage tanks, heaters, expansion tanks, circulating pumps, and other equipment: size to meet design requirements.
- .4 Energy Supply: natural gas.
- .5 Heaters to be condensing style.
- .6 Provide alternative means of heating domestic water using a double walled stainless steel plate and frame heat exchanger from the hydronic heating system.
- .2 Circulating Pumps:
 - .1 Type: all-bronze or stainless steel, vertical inline.
 - .2 Size for maximum 5°C temperature drop from domestic hot water supply temperature during non-peak hours and usage of 0 litres per minute.
 - .3 Design: 690 kPa working pressure and 105°C continuous service.
 - .4 Motor: drip-proof with thermal overload protection.
 - .5 Support circulating pumps: manufacturer's recommendations.
- .3 Storage Tanks:
 - .1 Construction: closed type pressure vessel, welded steel, with zinc rich primer, inside and out.
 - .2 Support: steel support saddles.
 - .3 Lining: internal corrosion resistant lining on tank and connections.
 - .4 Accessories: thermometer, access manhole, chlorine resistant stainless steel screwed fittings.

Part 3

Execution

3.1

INSTALLATION

- .1 Install equipment to manufacturer's recommendations.
- .2 Provide domestic water distribution system, including fittings required to service fixtures and equipment.
- .3 Insulate domestic water piping for energy conservation on hot water and recirculated water lines, and to prevent condensation from forming on cold water lines.
- .4 Piping Installation:
 - .1 Maintain minimum 0.5% grade, or steeper as required to drain or vent piping.
 - .2 Provide drain capability at low points.
 - .3 Install piping to conserve headroom and space.
 - .4 Route above grade piping parallel to walls.
 - .5 Where practicable, group piping at common elevations.
 - .6 Install concealed pipes close to building structure to keep furring to a minimum.
 - .7 Do not bury piping except for main service pipe riser.
- .5 Unions and Flanges: make connections to equipment and branch mains with unions or flanges; use gaskets on flanged connections for services.
- .6 Isolation Valves:
 - .1 Locate in accessible locations wherever possible, to facilitate maintenance.
 - .2 Locate at supply piping to fixtures, or group of fixtures, and equipment.
 - .3 Locate at branch take-offs and vertical risers.
 - .4 Locate where water shut-off valves for service or seasonal exposure to freezing conditions may be required. Provide the means to drain piping.
- .7 Locate throttling valves where throttling control of water is required.
- .8 Check Valves: locate at pump discharges, and where backflow prevention is required by plumbing code.
- .9 Drain Valves: locate near main shut-off valves, at low points in piping systems, at bases or vertical risers, and at equipment.
- .10 Water Hammer Arresters:
 - .1 Install to PDI-WH201.
 - .2 Locate in supply water lines at each fixture or group of fixtures, to prevent discernable water hammer during normal fixture operation.
 - .3 Provide with accessible isolation valve for hammer arrestor devices.
- .11 Install vacuum breakers as permitted on directly connected plumbing lines where contamination of domestic water may occur. Provide backflow prevention or air gaps in all other situations where contamination of domestic water may occur.

-
- .12 Under-floor piping is to be installed, supported and sealed at floor penetrations to maintain the following:
 - .1 Penetrations of the floor slab from underground to the main floor are to be sealed gas-tight to prevent the migration of methane gas into the aboveground spaces.

3.2 VERIFICATION

- .1 Operate equipment and verify that performance criteria specified in this Section has been achieved.
- .2 Verification requirements in accordance with Section 01 47 13 – LEED Requirements

END OF SECTION

Part 1 General

1.1 SUMMARY OF WORK

- .1 Section Includes:
 - .1 Materials and installation for sanitary waste and includes performance specification information for waste and vent piping, waste piping specialties, waste piping equipment and waste piping insulation.
- .2 Waste and Vent Piping Systems:
 - .1 . PVC, cast iron and copper pipe for buried and exposed pipe.
- .3 Waste Piping Specialties:
 - .1 Clean-outs and clean-out access covers.
 - .2 Floor drains.
 - .3 Area drains.
 - .4 Sumps.
 - .5 Grit traps.
 - .6 Oil/Water Separators.
- .4 Waste Piping Equipment:
 - .1 Submersible sump and sewage pumps.
- .5 Waste Piping Insulation:
- .6 Sustainable requirements for construction and verification.
 - .1 Energy efficiency.
 - .2 Waste conservation.
 - .3 Environmental protection.

1.2 RELATED SECTIONS

- .1 Section 01 33 00 – Submittal Procedures.
- .2 Section 01 47 13 – LEED Requirements
- .3 Section 01 74 11 – Cleaning.
- .4 Section 01 74 19 – Construction Waste Management and Disposal.
- .5 Section 01 78 00 – Closeout Submittals.
- .6 Section 01 91 13 – General Commissioning (Cx) Requirements.
- .7 Section 22 42 02 – Plumbing Fixtures.

1.3 REFERENCES

- .1 American Society for Testing and Materials International (ASTM)
 - .1 ASTM C547-07e1, Standard Specification for Mineral Fiber Pipe Insulation.
 - .2 ASTM D2564-04 (2009)e1, Standard Specification for Solvent Cements for Poly(Vinyl Chloride) (PVC) Plastic Piping Systems.
 - .3 ASTM B306 Standard Specification for Copper Drainage Tube (DWV).
- .2 Canadian General Standards Board (CGSB)
 - .1 CAN/CGSB 51-GP-52M-89, Vapour Barrier, Jacket and Facing Material for Pipe, Duct and Equipment Thermal Insulation.
- .3 Canadian Standards Association (CSA International)
 - .1 CAN/CSA-B1800-06/B181.2-06, PVC Drain, Waste and Vent Pipe and Pipe Fittings.
 - .2 CAN/CSA-B1800-06/B182.11-06, Recommended Practice for the Installation of Thermoplastic Drain, Storm and Sewer Pipe and Fittings.
 - .3 CSA B70, Cast Iron Soil Pipe, Fittings, and Means of Joining.
- .4 Manitoba Workplace Safety and Health Workplace Hazardous Materials Information System (WHMIS)
 - .1 Material Safety Data Sheets (MSDS).
- .5 National Plumbing Code of Canada 2010 as amended by the Manitoba Plumbing Code Regulation 32/2011.

- 1.4 PERFORMANCE REQUIREMENTS**
- .1 Design sanitary waste systems and install components in accordance with applicable regulations of the National Plumbing Code of Canada 2010 as amended by the Manitoba Plumbing Code Regulation 32/2011.
 - .2 Provide water and drainage connections to equipment furnished by the Contract Administrator.
 - .3 Design grade for horizontal sanitary waste piping: minimum 1% in direction of flow.
 - .4 Route pipes in an orderly manner, and maintain proper grades.
 - .5 Design piping routing located above grade in visible locations parallel to walls and adjacent building elements.
 - .6 Design building connections to street main: minimum of 2400 mm cover over pipe below finished grade.
- 1.5 SUBMITTALS**
- .1 Submittals in accordance with Section 01 33 00 – Submittal Procedures.
 - .2 Co-ordinate submittal requirements and provide submittals required by Section 01 47 13 – LEED Requirements.
 - .3 Product Data:
 - .1 Submit WHMIS MSDS in accordance with Section 01 47 13 – LEED Requirements. Indicate VOC's for adhesive and solvents during application and curing.
 - .4 Shop Drawings:
 - .1 Submit shop drawings for packaged submersible pumps and controls.
 - .2 Submit other details including grit separators and oil/water separators.
 - .3 Submit catalogue details for types of drain, separators neutralizer, trap, pump illustrating profiles, dimensions and methods of assembly.
 - .5 Instructions:
 - .1 Submit manufacturer's installation instructions.
 - .2 Submit manufacturer's instructions for commissioning activities for equipment provided in this Section.
 - .6 Closeout submittals: submit maintenance and engineering data for incorporation into manual specified in Section 01 78 00 – Closeout Submittals.
- 1.6 QUALITY ASSURANCE**
- .1 Utilize Design and installation personnel thoroughly familiar with systems of this type.
 - .2 Provide multiple units from same manufacturer.
 - .3 Health and Safety:
 - .1 Do construction occupational health and safety in accordance with Manitoba Workplace Safety and Health Requirements.
 - .4 COR Certification:
 - .1 All members of the Design Build Team are to be COR Certified to participate in the design, construction and commissioning.
- Part 2 Products**
- 2.1 MATERIALS**
- .1 Sustainable Requirements: Refer to Section 01 47 13 – LEED Requirements.
 - .2 Waste and Vent Piping Systems:
 - .1 PVC Pipe Components:
 - .1 Pipe: PVC plastic pipe to CAN/CSA-B181.2.
 - .2 Joint and fitting components:
 - .1 Fittings: PVC fittings to CAN/CSA-B181.2.
 - .2 PVC solvent cement: to ASTM D 2564.
 - .3 Cast-Iron Drainage, Vent Pipe and Fittings to CSA B70.
 - .4 Copper Drainage, Vent Piping and Fittings to ASTM B306.
 - .3 Waste Piping Specialties:
 - .1 Clean-outs and clean-out access covers:

- .1 Provide threaded type clean-outs extended to finished floor or wall surface.
- .2 Provide access covers for floors in unfinished areas: round with heavy wheel loading rated nickel bronze serrated frames and plates. Provide round access covers in finished areas with depressed centre section to accommodate floor finish. Provide wall clean-outs with chrome plated caps.
- .2 Floor drains:
 - .1 Typical: PVC body with double drainage flange, weep holes, combined two piece body, and adjustable heavy duty nickel/bronze strainer.
 - .2 Washroom floor drains: complete with a removable perforated sediment bucket.
 - .3 Equipment rooms: complete with a polished bronze funnel type strainer and extension for floating floor.
- .3 Area drains: epoxy coated cast iron body, adjustable collar and galvanized ductile iron locking grate suitable for heavy equipment wheel loads.
- .4 Waste Pumping Equipment:
 - .1 Submersible sump and sewage pumps:
 - .1 Type: completely submersible, vertical, centrifugal.
 - .2 Casing: cast iron volute and oil filled motor chamber.
 - .3 Impeller: bronze, non-clog with corrosion resistant alloy steel shaft.
 - .4 Bearings: anti-friction ball or roller.
 - .5 Accessories: oil resistant power cord with three prong connector on single phase, fractional horsepower units only.
 - .6 Duplex Controls: packaged pre-wired alternator with mercury type liquid level controls and control panel to cut in second pump on rising level or pump failure, and separate liquid level control for high level alarm.
 - .2 Waste Oil Tanks: ULC approved; conforming to the Environmental Code of Practice for Aboveground and Underground Storage Tank Systems containing Petroleum Products and Allied Petroleum Products.
 - .1 Tank: construction double walled or with secondary containment, gravity fed, with above ground connection to permit manual disposal and storage of other waste oil products.
 - .2 Provide accessories and signage as required by the Manitoba Regulations 188/2001 and 19/2011.
 - .3 Sump: reinforced concrete sumps, complete with necessary drainage fittings, 10 mm thick galvanized checkered steel plate covers with gasket seal frames anchor bolts.
 - .4 Oil/Water Separator: ULC approved; conforming to the Environmental Code of Practice for Aboveground and Underground Storage Tank Systems containing Petroleum Products and Allied Petroleum Products.
 - .1 Separator: construction gravity fed, double walled, inert to petroleum products, with venting system.
- .5 Waste Piping Insulation for Sanitary Mains from Second Floor:
 - .1 Material: 25 mm formed mineral fibre rigid insulation sleeving.
 - .2 "K" Value: maximum 0.035 W/m. °C at 24°C mean temperature.
 - .3 Service Temperature: -14°C to 100°C.
 - .4 Jacket: factory applied vapour barrier jacket to CAN/CGSB 51-GP-52Ma, Type 1, with longitudinal lap seal.

Part 3 Execution

3.1 MANUFACTURER'S INSTRUCTIONS

- .1 Compliance: comply with manufacturer's written recommendations or specifications, including product technical bulletins, handling, storage and installation instructions, and data sheet.

3.2 INSTALLATION

- .1 General
 - .1 Install components in accordance with CAN/CSA-B182.11.
 - .2 Route and install piping to maintain design grades.
 - .3 Install components to conserve headroom and space.
 - .4 Install concealed piping close to building structure to minimize furring.
 - .5 Group piping at common elevations.
 - .6 Arrange piping to compensate for expansion and contraction.
- .2 Building sewer service connection is provided under Division 33 from 1 m outside of the building foundation.
- .3 Floor Drains:
 - .1 Where floor drains are located over occupied areas, provide waterproof installation.
 - .2 Install trap primer to floor drains that will not experience regular flow.
 - .3 Provide dedicated drains for equipment in Mechanical Room.
- .4 Clean Outs: lubricate clean-out plugs with mixture of graphite and linseed oil. Prior to building turnover remove clean-out plugs, re-lubricate and reinstall using enough force to ensure permanent leak proof joint.
- .5 Under-floor piping is to be installed, supported and sealed at floor penetrations to maintain the following:
 - .1 Penetrations of the floor slab from underground to the main floor are to be sealed gas-tight to prevent the migration of methane gas into the aboveground spaces.
 - .2 Make connections to floor drains, cleanouts, and floor outlet fixtures with rigid mechanical joining methods that will resist pull-out and deflection.
 - .3 Do not use slip-joint pipe joining methods below the floor slab of any building.

3.3 PIPE SCHEDULE

.1 Install sanitary drain and vent lines as follows:

SERVICE	PIPE	FITTING	JOINT
DWV, Above Grade	PVC, copper, cast iron	PVC, copper, cast iron	Solvent weld, soldered, mechanical
DWV, Buried	PVC, cast iron	PVC, cast iron	Solvent weld, mechanical

3.4 INSULATION

- .1 Insulate minimum of 1500 mm of plumbing vents and above ground horizontal drain lines. Insulate exposed sanitary mains from second floor.

3.5 FIELD QUALITY CONTROL

- .1 Verification: Provide Contact Administrator with copy of video scope of sanitary lines both after installation and after slab pour.
- .2 .Verification requirements in accordance with Section 01 47 13 – LEED Requirements.

3.6 CLEANING

- .1 Perform cleaning operations as specified in Section 01 74 11 – Cleaning and in accordance with manufacturer's recommendations.

END OF SECTION

Part 1 General

1.1 SUMMARY

- .1 Section Includes:
 - .1 Materials and installation for General Service Compressed Air Systems and includes performance specification information for
 - .2 Compressed air production, storage and distribution systems.
 - .3 Pneumatic tool stations.
 - .4 Sustainable requirements for construction and verification.
 - .1 Energy efficiency, 01 47 13 – LEED Requirements.
- .2 Related Sections:
 - .1 Section 01 33 00 – Submittal Procedures.
 - .2 Section 01 47 13 – LEED Requirements.
 - .3 Section 01 74 19 – Construction Waste Management and Disposal.
 - .4 Section 01 74 11 – Cleaning.
 - .5 Section 01 78 00 – Closeout Submittals.
 - .6 Section 01 91 13 – General Commissioning (Cx) Requirements.

1.2 REFERENCES

- .1 American Society of Mechanical Engineers (ASME)
 - .1 ASME B16.11-2009, Forged Fittings Socket Welding and Threaded.
- .2 American Society for Testing and Materials International (ASTM)
 - .1 ASTM A48/A48M-03(2008), Standard Specification for Gray Iron Castings.
 - .2 ASTM A53/A53M-07, Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless.
 - .3 ASTM A181/A 181M-06, Standard Specification for Carbon Steel Forgings, for General-Purpose Piping.
 - .4 ASTM A216/A216M-08, Standard Specification for Steel Castings, Carbon, Suitable for Fusion Welding, for High-Temperature Service.
- .3 Canadian Standards Association (CSA International)
 - .1 CAN/CSA W48-06, Filler Metals and Allied Materials for Metal Arc Welding.
 - .2 CSA-W178.1-08, Certification of Welding Inspection Organizations.
 - .3 CSA-W178.2-08, Certification of Welding Inspectors.

1.3 PERFORMANCE REQUIREMENTS

- .1 Select equipment to operate at best efficiency points.
- .2 Compressed Air Systems: design system to deliver continuous 690 kPa pressure at compressed air fixtures, during full flow condition. Maintain pressure air dew point after dryer of -40°C.

1.4 SUBMITTALS

- .1 Submittals in accordance with Section 01 33 00 – Submittal Procedures.
- .2 Co-ordinate submittal requirements and provide submittals required by Section 01 47 13 – LEED Requirements.
- .3 Shop Drawings and Product Data:
 - .1 Submit Shop Drawings to indicate product dimensions, performance features and included accessories.
 - .2 Submit manufacturer's printed equipment literature, specifications and data sheet.
 - .3 Submit WHMIS MSDS in accordance with Section 01 47 17 – LEED Requirements. Indicate VOC's for adhesive and solvents during application and curing.

- .4 Operations and Maintenance Manuals:
 - .1 Submit manufacturer's installation instructions, operation and maintenance manuals for each major piece of equipment and system component.
 - .2 Submit manufacturer's instructions for commissioning activities for equipment provided in this section.
- .5 Closeout submittals: submit maintenance and engineering data for incorporation into manual specified in Section 01 78 00 – Closeout Submittals.

1.5 **QUALITY ASSURANCE**

- .1 Utilize design and installation personnel thoroughly familiar with systems of this type.
- .2 Provide multiple units from same manufacturer.
- .3 Health and Safety:
 - .1 Do construction occupational health and safety in accordance with Manitoba Workplace Safety and Health Requirements.
- .4 COR Certification:
 - .1 All members of the design/build team are to be COR Certified to participate in the design, construction and commissioning.
- .5 Verification: contractor's verification in accordance with Section 01 47 17 – LEED Requirements.

Part 2 **Products**

2.1 **MATERIALS**

- .1 Materials and resources in accordance with Section 01 47 13 – LEED Requirements.

2.2 **COMPRESSED AIR SYSTEMS**

- .1 Compressor: size and type to provide compressed air at design parameters to meet all shop loads and equipment usage as listed below and attached in Appendix C5.
 - .1 Control: Hand-Off-Auto starter, automatically cycled to maintain desired receiver pressure.
 - .2 Receiver: Maximize size to manage peak loads and minimize compressor cycling. Select receiver in accordance with the Manitoba Hydro recommendation for Power Smart compressor systems. Affix provincial inspector's certificate and label.
 - .3 Air Dryers: include necessary accessories, controls and appurtenances. Must be duplex unit for continuous drying of air at full consumption during maintenance and/or regeneration.
 - .4 Filter/Regulator: heavy duty, factory assembled with low pressure side relief valve. Parallel duplex filters with isolation valves are required to permit service during operation.
- .2 Piping: ASTM A53/A53M, Grade B or ASTM A106, Grade B, seamless or electric-resistance welded, Schedule 80 black steel. Fittings to ASME B16.11, Schedule 80 steel.
- .3 Valves: ASTM A181/A181M, Class 70.
- .4 Compressed air systems for Fleet Management Agency and the remainder of the facility are to be separate.

2.3 **PNEUMATIC TOOL STATIONS**

- .1 Minimum branch line size: 13 mm.
- .2 Provide drain pocket and blow-down valve at base of all lines flowing down.
- .3 Provide 15 m of compressed air hose in self-retracting reel c/w tire inflation chuck where designated in Room Data Sheets.

Part 3

Execution

3.1 MANUFACTURER'S INSTRUCTIONS

- .1 Compliance: comply with manufacturer's written data, including product technical bulletins, product catalog installation instructions, product carton installation instructions, and data sheets.

3.2 PREPARATION

- .1 Obtain approval of authorities having jurisdiction prior to commencing work of this section.

3.3 INSTALLATION

- .1 Compressed Air:
 - .1 Mount compressor with vibration isolators on housekeeping pad.
 - .2 Provide drain from refrigerated air dryer.
 - .3 Use zero-loss drains and coalescing filters to maintain air quality.
 - .4 Mount compressed air tool stations at 1200 mm above the floor c/w isolation valve, strainer, pressure regulator, oiler and control valve in the order of flow.
 - .5 Standard and special connectors and quick-release couplings are to be provided to match City of Winnipeg equipment.
- .2 Pressure test systems and submit results in writing to Consultant.

3.4 FIELD QUALITY CONTROL

- .1 Verification:
 - .1 Operate equipment and verify that performance criteria specified in this section has been achieved.
- .2 Verification requirements in accordance with Section 01 47 13 – LEED Requirements.

3.5 CLEANING

- .1 Perform cleaning operations as specified in Section 01 74 11 – Cleaning and in accordance with manufacturer's recommendations.

END OF SECTION

Part 1 General

1.1 SUMMARY OF WORK

- .1 This section includes the requirements for the following systems and features:
 - .1 Vehicle Wash Systems.
- .2 Sustainable requirements for construction and verification.
 - .1 Energy metering, water conservation, waste reduction, and performance optimization.
- .3 Related Sections:
 - .1 Section 01 33 00 – Submittal Procedures.
 - .2 Section 01 47 13 – LEED Requirements.
 - .3 Section 01 74 11 – Cleaning.
 - .4 Section 01 74 19 – Construction Waste Management and Disposal.
 - .5 Section 01 78 00 – Closeout Submittals.
 - .6 Section 01 91 13 – General Commissioning (Cx) Requirements.
 - .7 Section 22 11 19 – Domestic Water Distribution.
 - .8 Section 22 13 18 – Drainage, Waste and Vent Piping – Plastic.

1.2 REFERENCES

- .1 Manitoba Workplace Safety and Health Workplace Hazardous Materials Information System (WHMIS)
 - .1 Material Safety Data Sheets (MSDS).

1.3 SUBMITTALS

- .1 Submittals in accordance with Section 01 33 00 – Submittal Procedures.
- .2 Co-ordinate submittal requirements and provide submittals required by Section 01 47 13 – LEED Requirements.
- .3 Shop Drawings and Product Data:
 - .1 Submit Shop Drawings to indicate product dimensions, performance features and included accessories.
 - .2 Submit manufacturer's printed equipment literature, specifications and data sheet.
 - .3 Submit WHMIS MSDS in accordance with Section 01 47 17 – LEED Requirements. Indicate VOC's for adhesive and solvents during application and curing.
- .4 Operations and Maintenance Manuals:
 - .1 Submit manufacturer's installation instructions, operation and maintenance manuals for each major piece of equipment and system component.
 - .2 Submit manufacturer's instructions for commissioning activities for equipment provided in this section.
- .5 Closeout submittals: submit maintenance and engineering data for incorporation into manual specified in Section 01 78 00 – Closeout Submittals.

1.4 QUALITY ASSURANCE

- .1 Health and Safety:
 - .1 Do construction occupational health and safety in accordance with Manitoba Workplace Safety and Health regulations.
- .2 Verification: in accordance with Section 01 47 13 – LEED Requirements.

1.5 WARRANTY

- .1 For Work of this Section the standard 24 months warranty period applies.

1.6 MAINTENANCE SERVICE

- .1 Extended Services:

- .1 Provide extended service contract to conditions in Section 01 78 00 – Closeout Submittals.
- .2 Service contract: for 24 months from date of acceptance.
- .3 During service contract period, monitor system operation on a monthly basis and perform repairs and system servicing within 8 hours of fault detection or service call.

Part 2 Products

2.1 MATERIALS

- .1 Materials and resources in accordance with Section 01 47 13 – LEED Requirements.

2.2 COMPONENTS

- .1 Wash bays are to be drive-through (flow through).
- .2 Wands are to be manual trigger-controlled high pressure nozzles with pistol grip and hand guard.
- .3 Hoses are too organized so that all parts of a motor-grader can be reached for washing.
- .4 Control console for each wand-wash station is to offer the following options:
 - .1 Vehicle wash
 - .1 Prewash
 - .2 Foamy brush.
 - .3 Wash
 - .4 Wax
 - .5 Rinse.
 - .6 Vacuum.
 - .2 Heavy equipment wash.
 - .1 Degreaser
 - .2 Wash
 - .3 Wax
 - .4 Rinse
 - .5 Vacuum
- .5 Provide a vacuum unit with hoses at each wash station.
- .6 Provide a wash water pumping and metering system c/w chemical mixing and holding tanks, metering valves.
 - .1 Provide wash water heating to the optimum temperature to remove ice, grease, oil and maximize cleaning chemical effectiveness.
- .7 Backflow prevention on the domestic water make-up.

2.3 CORROSION RESISTANCE

- .1 Use materials like stainless steel, rubber, plastic, aluminum and brass that are resistant to corrosion wherever possible.
- .2 Isolate dissimilar metals to prevent galvanic corrosion.

2.4 MOTORS

- .1 All motors are to be TEFC, “Hostile Environment” motors with NEMA 4 electrical connection boxes and corrosion resistant unpainted parts.

Part 3 Execution

3.1 MANUFACTURER’S INSTRUCTION

- .1 Compliance: Comply with manufacturer’s written recommendations or specifications, including product bulletins, handling, storage, and installation instructions, and data sheet.

3.2 INSTALLATION

- .1 Install equipment to manufacturer’s written instructions.

- .2 Piping: arrange and support piping to allow complete draining of the system, to prevent shock and water hammer from air in the system, and to eliminate stress and vibration related noise in the piping due to operating pumps and automatic valves.
- .3 Equipment:
 - .1 Install equipment with vibration isolation at connections between pumps and piping or structure.
 - .2 Install all equipment on a minimum 100 high housekeeping pad.
 - .3 Anchor all equipment to the floor, pads or structure using stainless steel fasteners grade T304 or better.
 - .4 Align pumps and their drivers prior to first operation, and recheck after 50 hours of operation. Realign the drivers if required.
- .4 Provide sufficient hose length on wand wash stations to reach all parts of the largest vehicle that will be washed in the facility.

3.3 FIELD QUALITY CONTROL

- .1 Verification requirements in accordance with Section 01 47 17 – LEED Requirements.
- .2 Performance Verification:
 - .1 Operate equipment and verify that performance criteria specified in this section has been achieved.
 - .2 Perform periodic site inspection visits by manufacturer's representative to verify that installation complies with manufacturer's instructions:
 - .1 After delivery and storage of products.
 - .2 After installation and cleaning is complete.
 - .3 Coordinate and cooperate with the third-party Commissioning Agent that will be identified by the Contract Administrator.

3.4 COMMISSIONING

- .1 Commission equipment of this Section to 01 91 13 – General Commissioning (Cx) Requirements.
- .2 Test and adjust pumps, level and pressure control, wax, degreaser and soap feeders. Prove that equipment operates in manufacturer's published operating range for selected model.

3.5 CLEANING

- .1 On completion and verification of performance of installation, remove surplus materials, excess materials, rubbish, tools and equipment.

END OF SECTION

Part 1

1.1

General

SUMMARY

- .1 Section Includes:
 - .1 Materials and installation for plumbing fixtures.
 - .2 Sinks:
 - .1 Lavatory Sinks.
 - .2 Countertop Stainless Steel Sinks
 - .3 Utility Basins.
 - .4 Service Sinks.
 - .3 Showers.
 - .4 Urinals.
 - .5 Water Closets.
 - .6 Drinking Fountain/Cooler.
 - .7 Emergency Eyewash Stations.
 - .8 Other Plumbing Fixtures.
- .2 Related Sections:
 - .1 Section 01 33 00 – Submittal Procedures.
 - .2 Section 01 47 13 – LEED Requirements.
 - .3 Section 01 74 11 – Cleaning.
 - .4 Section 01 74 19 – Construction Waste Management and Disposal.
 - .5 Section 01 78 00 – Closeout Submittals.
 - .6 Section 01 91 13 – General Commissioning (Cx) Requirements.
 - .7 Section 22 11 19 – Domestic Water Distribution.
 - .8 Section 22 13 18 – Drainage, Waste and Vent Piping-Plastic.
 - .9 Section 22 42 00 – Special Plumbing Systems.

1.2

REFERENCES

- .1 American Refrigeration Institute (ARI.)
 - .1 ARI 1010-02, Self-Contained, Mechanically Refrigerated Drinking-Water Coolers.
 - .2 Canadian Standards Association (CSA International)
 - .1 .CAN/CSA B45 Series-02, Plumbing Fixtures.
 - .2 CAN/CSA B125-05, Plumbing Fittings.
 - .3 CAN/CSA-B651-M95 (R2001), Barrier-Free Design.
 - .3 City of Winnipeg Universal Design Policy.
 - .4 American National Standards Institute (ANSI)
 - .1 ANSI Z358.1-04, "American National Standard for Emergency Eyewash and Shower Equipment.

1.3

PERFORMANCE REQUIREMENTS

- .1 Provide low flow fixtures where shown and specified.
- .2 Provide barrier-free fixtures where indicated and specified, to CAN/CSA-B651.

1.4

SUBMITTALS

- .1 Submittals in accordance with Section 01 33 00 – Submittal Procedures.
- .2 Coordinate submittal requirements and provide submittals required by Section 01 47 13 – LEED Requirements.
- .3 Product Data:
 - .1 Submit manufacturer's printed product literature, specifications and datasheet for fixtures and equipment.
 - .2 Submit WHMIS MSDS in accordance with Section 01 47 13 – LEED Requirements. Indicate VOC's for adhesive and solvents during application and curing.
- .4 Closeout submittals: submit maintenance and engineering data for incorporation into manual specified in Section 01 78 00 – Closeout Submittals.

- .5 Test Reports: submit certified test reports from approved independent testing laboratories indicating compliance with specifications for specified performance characteristics and physical properties.
- .6 Certificates: submit certificates signed by manufacturer certifying that materials comply with specified performance characteristics and physical properties.
- .7 Manufacturer's Field Services: submit reports within 3 days of receipt from manufacturer.
- .8 Instructions: submit manufacturer's installation instructions.

1.5 QUALITY ASSURANCE

- .1 Utilize design and installation personnel thoroughly familiar with systems of this type.
- .2 Health and Safety:
 - .1 Do construction occupational health and safety in accordance with Manitoba Workplace Safety and Health Requirements.
- .3 COR Certification:
 - .1 All members of the Design Build Team are to be COR Certified to participate in the design, construction and commissioning.

1.6 DELIVERY, STORAGE AND HANDLING

- .1 Maintain piping and valve cleanliness by protecting open ends from entry by dust, water, debris or vermin during delivery and storage.
- .2 Material damaged in transit or during storage and handling is to be replaced prior to installations.
- .3 Material for use in potable water system shall be stored in a weather-tight storage building or construction

Part 2 Products

2.1 SUSTAINABLE REQUIREMENTS

- .1 Refer to Section 01 47 13 – LEED Requirements.

2.2 MATERIALS

- .1 Materials and resources in accordance with Section 01 47 13 – LEED Requirements.
- .2 Fixtures: free from flaws and blemishes, clear, smooth and bright surface finish.
- .3 Exposed Brass: high quality institutional grade, chrome plated

2.3 SINKS

- .1 Sinks:
 - S-1 Kindred model QDL2031/8 non-staining material, self-rimming, two compartment sink with undercoating, three(3) hole drilling in ledge back at 102 mm on center, 410 x 360 x 200 mm. Zurn Model Z871G6 polished chrome plated 203 mm brass deck faucet with 203 mm cast brass swing spout c/w 8.3L/min compensating aerator.
 - S-2 Kindred model QSL2020/8 non-staining material, self-rimming, single compartment sink with undercoating, three(3) hole drilling in ledge back at 102 mm on center, 410 x 460 x 200 mm. Zurn Model Z871G6 polished chrome plated 203 mm brass deck faucet with 203 mm cast brass swing spout c/w 8.3L/min compensating aerator.
 - S-3 Zurn Model Z871H4 polished chrome plated brass deck faucet, 203 mm tubular swing spout and quarter turn ceramic disc cartridge, c/w 8.3L/min compensating aerator, 120mm vandal-resistant color-coded metal wrist blade handles, mounting hardware and ½" NPSM coupling nuts for standard lavatory risers.
 - S-4 Bradley model Wf2604 semi-circular wash fountain non-staining material, self rimming, sensor control valve, thermostatic mixing valve. Trim: chrome plated with fixed spout and aerator.

- S-5 FLTD II floor mounted laundry tub. 2 holes 200 mm on center, 1016 x 610 x 352 mm. Zurn Z871H4 polished 200 mm brass deck faucet with a 305 mm tubular swing spout and quarter turn ceramic disc cartridges. Faucet c/w hot/cold test indexes, hose and spray, 3.8L vandal resistant pressure compensating female spray outlet.
- .2 Lavatory Sinks:
- L-1 Zurn model Z5110 counter mounted lavatory, front overflow opening, self rimming, vitreous china, Size: 500 x 312 mm Zurn model Z6915-GEN faucet proximity sensor, waterproof, incorporated into unit body, impact and scratch resistant lens, manual override button, Proximity Adjustment: 100 mm, Run Time: 0-60 seconds maximum, adjustable Power: AC 110 volt circuit c/w transformer, UL and CSA listed, Flow rate of 1.9 L/min. Zurn model Z8743-PC Chrome plated cast brass solid top, open grid, P.O. plug. Zurn model Z8700-PC Chrome plated cast brass body 'P' trap with cleanout.
- L-2 Zurn model Z5320 wall hung lavatory, front overflow opening, self rimming, vitreous china, Size: 584 x 514 mm x 88 mm Zurn model Z6915-GEN faucet proximity sensor, waterproof, incorporated into unit body, impact and scratch resistant lens, manual override button, Proximity Adjustment: 100 mm, Run Time: 0-60 seconds maximum, adjustable Power: AC 110 volt circuit c/w transformer, UL and CSA listed, Flow rate of 1.9 L/min. Zurn model Z8747-PC strainer offset cast brass body with up to 279 mm offset P.O. plug. Zurn model Z8700-PC Chrome plated cast brass body 'P' trap with cleanout. Watts Drainage ca-411 floor mounted lavatory carrier.
- .3 Service and Slop Sink:
- MS-1 Fiat model TTB 3624 900 x 600 x 250 mm size, floor mounted sink with 25 mm wide shoulders, stainless steel strainer. Zurn Z842M2 cast brass 200 mm faucet with quarter turn ceramic disc cartridges. 152 mm centerline vacuum breaker spout with a 19 mm hose threaded outlet. Provide stainless steel slash guards between the fixture and the adjacent wall(s) and surfaces on two sides, extending 460mm above the fixture rim up the wall.
- .4 Showers:
- SH-1 Venco 3636FW gel coated shower unit, fiberglass reinforced, 900 x 900 x 1975 mm. Zurn Z7301-SS-MT-S9 single handle pressure balancing mixing shower unit, two service stops/check stops and adjustable limit top c/w 13 mm female copper sweat connections w/ service stops.
- SH-2 Fiat a6637.01 high gloss acrylic institutional shower unit, fiberglass reinforced, safety textured shower bottom pattern, stainless steel corner grab bar, right hand seat, 914 x 1676 x 2159 mm. Zurn Z7300-SS-MT-HW-H9 single handle pressure balancing mixing shower unit, two service stops/check stops and adjustable limit top c/w 13 mm female copper sweat connections w/ service stops.
- SH-3 Fiat MS-4836 Celeste thermoformed cross linked acrylic sheet, reinforced in back with fiberglass and polyester resin, textured floor with center drain, two integral molded seats, soap dish, shelves and towel bar, 914 x 1270 x 2172 mm. Zurn Z7300-SS-MT-HW-H9 single handle pressure balancing mixing shower unit, two service stops/check stops and adjustable limit top c/w 13 mm female copper sweat connections w/ service stops.
- 2.4 URINALS**
- .1 Urinals:
- U-1 Zurn Z5798.263.00 Low Consumption Urinal. 0.5 L/flush, vitreous china valve operated by Zurn 4.0 sensor and powered by self sustaining hydro generator.
- 2.5 WATER CLOSETS**
- .1 Water Closets:
- WC-1 Zurn Z5615-BWL elongated wall hung water closet. 4.8 L/flush, vitreous china with siphon jet flushing. Zurn Z 5955SS-AM elongated standard white open front toilet seat, less cover with stainless steel check hinge and anti microbial protection. Zurn Z GEN6200EV Hydro Generator Powered Flush Valve. 4.8

L/flush flush valve operated by Zurn 4.0 sensor and powered by self sustaining hydro generator.

WC-2 Zurn Z5615-BWL elongated wall hung water closet. 4.8 L/flush, vitreous china with siphon jet flushing. Zurn Z 5957SS-EL elongated standard white open front toilet seat, with cover with stainless steel check hinge and anti microbial protection. Zurn ZGEN6200EV Hydro Generator Powered Flush Valve. 4.8 L/flush flush valve operated by Zurn 4.0 sensor and powered by self sustaining hydro generator.

2.6 FOUNTAIN/COOLER

.1 Water Fountains:

WF-1 Halsey Taylor HVRGRN8 barrier free refrigerated Fountain/Cooler. stainless steel cooler top with satin finish. Self closing vandal resistant pushbutton, in line strainer, R134A refrigerant, ADA compliant.

2.7 EYE WASH STATION

.1 Eye Wash Stations:

EW-1 Bradley model S19224 Emergency Eye Wash Station: wall mounted, plastic bowl and dust covers, twin spray nozzle stay open valve, backflow prevention, galvanized steel pipe, stainless steel push flag with trap. Bradley Model S19-2000 Thermostatic Mixing Valve: complete with check valve, surface mount stainless steel, dial thermometer, strainer stop check on inlet, mounted in lockable cabinet.

EW-2 Bradley model S19314 Emergency Eye Wash Station and shower: wall mounted, plastic bowl shower head and dust cover, twin spray nozzle stay open valve, galvanized steel pipe, stainless steel push flag with trap according to ANSI Z358.1-04. C/w Bradley S19-330 Privacy Curtain. Bradley Model S19-2100 Thermostatic Mixing Valve: complete with check valve, surface mount stainless steel, volume control shut-off valve on outlet, stem type thermometer on outlet, strainer stop check on inlet, mounted in lockable cabinet.

2.8 FLOOR DRAIN

.1 Floor Drain

FD-1 Watts Drainage FD-100-C-A PVC body with minimum 150 mm diameter adjustable nickel-bronze strainer per Section 22 13 18, reversible membrane clamp with primary and secondary weepholes.

.2 Funnel Floor Drain

FFD-1 Watts Drainage FD-100-C-EG PVC body with minimum 200 mm diameter throat, reversible membrane clamp with primary and secondary weepholes.

2.9 FIXTURE PIPING

.1 Supply: flexible, non-metallic, individual shut-off valves, escutcheon at wall in exposed areas.

.2 Waste: non-metallic, with P trap and cleanout on fixtures with no integral trap.

.3 Trap Primers

TP-1 Zurn Z1020 electronic trap primer. electronic trap primer programmed as standard to provide a six second water injection to traps every twenty four hours. brass ball type stop valve, slow closing 24 VAC solenoid valve with integral strainer 120-24 VAC transformer. C/w ten outlets option.

TP-2 Zurn Z1020 electronic trap primer. electronic trap primer programmed as standard to provide a six second water injection to traps every twenty four hours. brass ball type stop valve, slow closing 24 VAC solenoid valve with integral strainer 120-24 VAC transformer.

TP-3 Zurn Z1022 automatic trap primer. Sani-Gard automatic trap primer, all bronze body with integral vacuum breaker, non limiting internal operating assembly with gasketed bronze cover. C/w IP male union and chrome plated finish.

Part 3 Execution

3.1 MANUFACTURERS INSTALLATION

- .1 Compliance: comply with manufacturer's written recommendations or specifications, including product technical bulletins, handling, storage and installation instructions, and datasheet.

3.2 INSTALLATION

- .1 Locate plumbing fixtures at locations shown on drawings, in numbers required by code and as indicated in the Program of Requirements.
- .2 Provide barrier free fixtures where required.
- .3 Seal sinks to prevent water leaks.
- .4 Provide flexible supplies to fixtures with screwdriver stops, reducers and escutcheons.
- .5 Wall Mounted Fixtures: use approved floor supported carriers to suit application.
- .6 Floor Mounted Fixtures: solidly attach water closets to floor with lag screws and bolt cap. Do not use lead flashing to hold closet in place.
- .7 Install hose and faucets and hose connections with vacuum breakers.
- .8 Supply hot and cold water to shower heads and water stops.
- .9 Clean exposed fixtures after installation is complete.

3.3 FIELD QUALITY CONTROL

- .1 Site Tests/Inspection.
 - .1 Operate equipment and verify that performance criteria specified in this section has been achieved.
 - .2 Pressure test piping to same standards as domestic water piping code requirements.
 - .3 Measure delivery at emergency eyewash station and adjustable fixtures to ensure design pressure and flow performance. Adjust if necessary to meet requirements of CSA B45, CSA B125, and ANSI Z358.1.
- .2 Verification requirements in accordance with Section 01 47 13 – LEED Requirements.

3.4 CLEANING

- .1 Perform cleaning operations as specified in Section 01 74 11 – Cleaning and in accordance with manufacturer's recommendations.

END OF SECTION

Part 1 General

1.1 RELATED SECTIONS

.1 This section covers all items in the Mechanical scope of work and is to be read in conjunction with all sections of the Mechanical Division and in common with related requirements from all other sections as they pertain to Mechanical.

- .1 Section 01 33 00 – Submittal Procedures
- .2 Section 01 47 13 – LEED Requirements.
- .3 Section 01 47 17 – Sustainable Requirements: Contractor's Verification.
- .4 Section 01 74 11 – Cleaning.
- .5 Section 01 74 19 – Construction Waste Management and Disposal.
- .6 Section 01 78 00 – Closeout Submittals.
- .7 Section 01 91 13 – General Commissioning (Cx) Requirements.
- .8 Section 23 05 93 – Testing, Adjusting and Balancing for HVAC.
- .9 Section 23 11 00 – Energy Supply
- .10 Section 23 21 00 – Heat Generation
- .11 Section 23 30 00 – HVAC Distribution
- .12 Section 23 81 00 – Refrigeration
- .13 Section 23 82 00 – Terminal and Packaged Units
- .14 Section 23 84 00 – Other HVAC Systems and Equipment.

1.2 REFERENCES

.1 Provide a complete and code compliant design, in accordance with the following codes and standards:

- .1 The National Building Code of Canada 2010 (NBC) as referenced by and amended by the Manitoba Building Code (MBC) Regulation 31/2011;
- .2 The National Fire Code of Canada 2005 (NFC) as referenced by and amended by the Manitoba Fire Code (MFC) Regulation 216/2006;
- .3 The National Plumbing Code of Canada 2010 (NPC) as referenced by and amended by the Manitoba Plumbing Code (MPC) Regulation 32/2011;
- .4 The Model National Energy Code of Canada, 1997;
- .5 The City of Winnipeg Bylaws and Regulations;
- .6 National Fire Protection Association (NFPA) Standards
- .7 American Society of Heating, Refrigeration and Air Conditioning Engineers (ASHRAE) guides, data books and standards;
- .8 Sheet Metal and Air Conditioning Contractor's National Association (SMACNA);
- .9 Heating, Refrigeration and Air Conditioning Institute of Canada (HRAI) digests
- .10 The Hydronic Institute (HI);
- .11 Industrial Ventilation Manual as published by the American Conference of Government Industrial Hygienists (ACGIH);
- .12 The Canadian Standards Association (CSA);
- .13 The Canadian Green Building Council (CGBC);
- .14 The Underwriter's Laboratory of Canada (ULC) or its equivalent as accepted under the MBC, MFC, and MPC;
- .15 The American Society of Plumbing Engineers (ASPE);
- .16 As further listed or referenced within this request for proposal.

.2 The materials and products used within the design shall be compliant with the requirements of:

- .1 The Canadian Standards Association (CSA);
- .2 The Underwriter's Laboratory of Canada (ULC) or its equivalent as accepted under the MBC, MFC, and MPC.
- .3 The American National Standards Institute (ANSI);
- .4 The American Society of Mechanical Engineers (ASME);
- .5 The American Society for Testing and Materials International (ASTM);
- .6 The Canadian General Standards Board (CGSB);
- .7 The City of Winnipeg Construction Standards.

1.3 DESIGN PERFORMANCE REQUIREMENTS

- .1 Ambient Design Conditions:
 - .1 Exterior:
 - .1 Winter: to local building code for project location, 1% January design temperature and wind velocity of 4.6 m/s.
 - .2 Summer: to local building code for project location, 2.5% July design day and wet bulb temperature, wind velocity of 2.3 m/s.
 - .2 Interior:
 - .1 General interior spaces: 23°C and minimum 30% relative humidity, at minimum and maximum design outside ambient conditions.
 - .2 Special interior spaces: Shops, enclosed storage and vehicle garages are to be heated to 15°C in Street Maintenance, 22°C in Bridge Operations and 22°C in Fleet management.
 - .3 Comfort Conditions shall meet or exceed those stated below, and in accordance with the requirements of the LEED® as specified in Section 01 47 13 LEED Requirements, and values established by the Canadian Green Building Council. Systems are to maintain comfort conditions as listed in ASHRAE 55-2004.
- .2 Energy Considerations:
 - .1 Design and select mechanical systems to the requirements of the Model National Energy Code for Buildings (MNECB) 1997 as issued by the National Research Council of Canada.
 - .2 Design and select mechanical equipment and systems to meet ASHRAE/IESNA 90.1 – 2007, “Energy Standard for Buildings except Low Rise Residential Buildings”.
 - .3 Energy sources are to be chosen based on energy efficiency and operating cost, with preference to renewable energy sources and carbon generation impact. Strategies include:
 - .1 Incorporating air-to-air heat exchangers and energy recovery devices to reduce energy discharge from exhaust air streams and recover moisture from airstreams not containing hazardous contaminants.
- .3 Air Quality:
 - .1 Anticipated number of building occupants indoors will vary based on seasons, and shifts. The maximum number of building occupants to be designed for on a continuous occupancy basis is 55. Short term occupancy for meetings, training, at shift changes and during emergency operations will exceed the above, and will impact the design capacity of building systems. Design short term occupancies for 150 persons. MET-Rate Activity Summary Table in Appendix C3 provides the gender and level of effort expended by the full-time occupants, and their assigned locations for peak calculations.
 - .2 Carbon dioxide: limit maximum carbon dioxide levels to 700 ppm.
 - .3 Minimum fresh air: not less than required by ASHRAE Standard 62-2007.
 - .4 Locate fresh air intakes to prevent contamination by external sources such as road traffic, idling vehicles, smoke stacks or exhaust outlets, and wind-driven odours from nearby properties.
 - .5 Carbon Monoxide (CO): Levels of 12.5 parts per million in areas where motor vehicles are stored or operated are to cause first stage alarm conditions and start ventilation systems to control the concentration of CO. Levels of 25 parts per million are to cause the ventilation system to increase to full purge mode, and announce as both an audible and visual alarm. Levels of carbon monoxide in all areas are to be controlled to the 8 hour Threshold Limit Value according to the ACGIH standards. Vehicle operation within enclosed garage areas will be limited to 5 minutes duration of 25% of the fleet of vehicles stored.
 - .6 Nitrogen Oxides (NO_x): Control the levels to 0.25 parts per million using ventilation, set alarms to actuate at 1.5 ppm, one half of the 8-hour Threshold Limit Value according to the ACGIH standards. Vehicle operation within enclosed garage areas will be limited to 25% of the fleet of vehicles stored.

- .4 Ventilation:
 - .1 Provide 100% outside air intake at outdoor ambient temperatures above 18°C to garages and shops where hazardous materials and processes are located. Below 18°C, provide sufficient ventilation to control the hazards that may be created in the space.
 - .2 Minimum ventilation:
 - .1 Minimum ventilation rates shall be in accordance with ASHRAE 62.1 – 2007.
 - .3 Shops, shipping, receiving and truck areas:
 - .1 Ventilate with dedicated heat recovery set to run at minimum speed during occupied hours. Secondary make up air and exhaust systems controlled by carbon monoxide and nitrogen dioxide detection and alarm systems will be provided to purge spaces. Provide make-up air from outside air via make up air units on the roof. Exhaust from high and low level.
 - .4 Special ventilation systems to control particulates, mists, gases and vapours at the source are specified in Section 23 84 00 – Other HVAC Systems and Equipment.

1.4 SUBMITTALS

- .1 Submit documentation of design approach in MNECB recommended format. Indicate whether building will be designed to prescriptive, performance or trade-off approaches.
- .2 Submit documentation for approval of Contract Administrator:
 - .1 Indoor design temperatures.
 - .2 Location of dampers and thermostatic controls and cutoffs.
 - .3 Air flow control areas and temperature control zones.
 - .4 Efficiency of unit and packaged heating equipment.
 - .5 Power requirements for operation of heating, ventilating and cooling systems with air volumes and type of control used for ventilation.
 - .6 Types and capacities of, and controls for, heating and cooling systems.
 - .7 Heat recovery ventilators: description of characteristics.
 - .8 Service water heating equipment: efficiency.
 - .9 Service water distribution layouts and controls.
 - .10 Drawings and Specifications including:
 - .1 Plans, drawn to scale, that indicate nature and extent of work.
 - .2 System capabilities at design conditions.
 - .3 Performance characteristics.
 - .4 Distribution arrangement.
 - .5 Sequence of operation.
 - .6 Start/Stop procedures.
 - .7 Schematic and control diagrams of systems.
 - .11 Whole Building Energy Simulation showing comparison of proposed construction to MNECB model.
- .3 Tag schedule: submit identification flow diagram for hydronic system. Include valve tag schedule, designating number, service, function and location of each tagged item and normal operating position of each valve.

1.5 QUALITY ASSURANCE

- .1 Utilize design and installation personnel thoroughly familiar with systems of this type.
- .2 Health and Safety:
 - .1 Do construction occupational health and safety in accordance with Manitoba Workplace Safety and Health Requirements.
- .3 COR Certification:
 - .1 All members of the design/build team are to be COR Certified to participate in the design, construction and commissioning.

Part 2 Products

2.5 SUSTAINABLE REQUIREMENTS

- .1 Refer to Section 01 47 13 – LEED Requirements.

Part 3 Execution

3.5 MANUFACTURER'S INSTRUCTIONS

- .1 Compliance: comply with manufacturer's written recommendations or specifications, including product technical bulletins, handling, storage and installation instructions, and datasheet.

3.6 FIELD QUALITY CONTROL

- .1 Verification requirements in accordance with Section 01 47 17 – Sustainable Requirements: Contractor's Verification, include:
- .1 Materials and resources.
 - .2 Storage and collection of recyclables.
 - .3 Construction waste management.
 - .4 Resource reuse.
 - .5 Recycled content.
 - .6 Local/regional materials.
 - .7 Low-emitting materials.

3.7 MAINTENANCE

- .1 Design to provide:
- .1 Easy access for cleaning and inspecting filters. Use high quality industrial grade equipment to meet the Durable Building requirements.
 - .2 Access to air handling units for service, inspection, and to facilitate effective drainage of air handling units (AHU's).
 - .3 No equipment that requires maintenance, repair, or replacement is to be installed below the floor slab.
 - .4 Where rooftop equipment cannot be avoided, provide guardrails if within 1.5m of the edge of the roof and service decks to protect roof from damage.

END OF SECTION

Part 1 General

1.1 SUMMARY

- .1 Section Includes:
 - .1 Materials and installation for balancing and certification of HVAC air and liquid systems.
 - .2 Sustainable requirements for construction and verification.
 - .1 Refer to Section 01 47 13 – LEED Requirements,
- .2 Related Sections:
 - .1 Section 01 33 00 – Submittal Procedures.
 - .2 Section 01 47 13 – LEED Requirements.
 - .3 Section 01 47 17 – Sustainable Requirements: Contractor's Verification.
 - .4 Section 01 74 11 – Cleaning.
 - .5 Section 01 74 19 – Construction Waste Management and Disposal.
 - .6 Section 01 91 13 – General Commissioning (Cx) Requirements.
 - .7 Section 01 78 00 – Closeout Submittals.
 - .8 Section 23 05 00 – Design Requirements – HVAC.
 - .9 Section 23 11 00 – Energy Supply.
 - .10 Section 23 21 00 – Heat Generation.
 - .11 Section 23 30 00 – HVAC Distribution.
 - .12 Section 23 81 00 – Refrigeration.
 - .13 Section 23 82 00 – Terminal and Packaged Units.
 - .14 Section 23 84 00 – Other HVAC Systems and Equipment.

1.2 REFERENCES

- .1 Associated Air Balance Council (AABC).
 - .1 National Standards for Total System Balance 2002.

1.3 DESIGN REQUIREMENTS

- .1 Perform air and water balancing, to minimum requirements specified in AABC, National Standards manual.

1.4 SUBMITTALS

- .1 Submittals in accordance with Section 01 33 00 – Submittal Procedures.
- .2 Co-ordinate submittal requirements and provide submittals required by Section 01 47 17 – Sustainable Requirements: Contractor's Verification.
- .3 Product Data:
 - .1 Submit manufacturer's printed product literature, specifications and data sheet for testing and balancing equipment.
- .4 Instructions: submit manufacturer's installation instructions.
- .5 Reports:
 - .1 Submit four copies of Balancing and Certifying Report upon completion of work.
 - .2 Report Format: AABC Test and Balance Procedures manual. Include recommendations where additional balancing devices should be installed. Include actual test procedure details, initial and final balanced performance figures.

1.5 QUALITY ASSURANCE

- .1 Engage balancing agency accredited by the Associated Air Balance Council (AABC).
- .2 Measurement Instruments: calibrated to AABC recommendations.
- .3 Health and Safety:
 - .1 Do construction occupational health and safety in accordance with Manitoba Workplace Safety and Health Requirements.

- .4 COR Certification:
 - .1 All members of the design/build team are to be COR Certified to participate in the design, construction and commissioning.

Part 2 Products Not Used

Part 3 Execution

3.1 ADJUSTING

- .1 Perform system balancing to AABC - Test and Balance Procedures.
- .2 Permanently and indelibly mark valve, damper and other adjustment device settings in their balanced position.
- .3 Set and lock memory stop balancing devices.
- .4 Balance liquid systems only after successful balancing of air systems.

3.2 FIELD QUALITY CONTROL

- .1 Performance Verification:
 - .1 Perform random flow readings in presence of the Contract Administrator after completion of balancing report. If inconsistencies are noted between balancing report and random readings, re-balance entire system and re-submit balancing report until random readings coincide with report at no additional cost.

END OF SECTION

Part 1 General

1.1 RELATED SECTIONS

- .1 Section 01 33 00 – Submittal Procedures.
- .2 Section 01 47 13 – LEED Requirements.
- .3 Section 01 47 17 – Sustainable Requirements – Contractor's Verification.
- .4 Section 01 74 11 – Cleaning.
- .5 Section 01 74 19 – Construction Waste Management and Disposal.
- .6 Section 01 78 00 – Closeout Submittals.
- .7 Section 01 91 13 – General Commissioning (Cx) Requirements.
- .8 Section 23 21 00 – Heat Generation.
- .9 Division 26 – Electrical

1.2 REFERENCES

- .1 Canadian Standards Association (CSA International)
 - .1 CAN/CSA-B139-04, Installation Code for Oil-Burning Equipment.
 - .2 CAN/CGA-B149.1-05, Natural Gas and Propane Installation Code.
- .2 Manitoba Workplace Safety and Health Workplace Hazardous Materials Information System (WHMIS)
 - .1 Material Safety Data Sheets (MSDS).
- .3 National Fire Code of Canada 2005 as amended by the Manitoba Fire Code under Manitoba Regulation 216/2006.

1.3 DESIGN PERFORMANCE REQUIREMENTS

- .1 Radiant Heating:
 - .1 Natural gas-fired radiant tube heaters in shop and vehicle garage areas for quick recovery.
- .2 Hot Water:
 - .1 Source: High-efficiency condensing natural gas boilers.
 - .2 Domestic Hot Water: Turbomax instantaneous indirect water heaters.

Part 2 Products

2.1 SUSTAINABLE REQUIREMENTS

- .1 Materials and products in accordance with Sections
 - .1 01 47 17 – Sustainable Requirements: Contractor's Verification.
 - .2 01 47 13 – LEED Requirements.

2.2 MATERIALS

- .1 Piping:
 - .1 Materials: to latest code and standard for application.
 - .2 Design systems drainable and serviceable.
- .2 Fuel Source:
 - .1 Natural gas: coordinate and pay all fees and contribution of cost to have Manitoba Hydro supply an adequate size of natural gas meter and regulator.

Part 3 Execution

3.1 MANUFACTURER'S INSTRUCTION

- .1 Compliance: comply with manufacturer's written recommendations or specifications, including product technical bulletins, handling, storage and installation instructions, and datasheet.

3.2 **INSTALLATION**

- .1 Install to manufacturer's written installation instructions.
- .2 Install systems in accordance with latest codes and standards. Install to approval of authorities having jurisdiction.
- .3 Provide required connections and piping at mains, including necessary valves and service vaults from main to equipment.
- .4 Install natural gas pipe and equipment to CAN/CGA-B149.1, and to utility requirements.

3.3 **FIELD QUALITY CONTROL**

- .1 Verification requirements in accordance with Section 01 47 17 - Sustainable Requirements: Contractor's Verification, include:
 - .1 Materials and resources.
 - .2 Storage and collection of recyclables.
 - .3 Construction waste management.
 - .4 Resource reuse.
 - .5 Recycled content.
 - .6 Local/regional materials.
 - .7 Low-emitting materials.

END OF SECTION

Part 1**General****1.1****SUMMARY**

- .1 Section Includes:
 - .1 Materials and installation for:
 - .1 Condensing Boilers.
 - .2 Auxiliary Equipment.
 - .3 Direct Fired Make-up Air Units.
 - .4 Overhead radiant heaters in shops areas.
 - .2 Sustainable requirements for construction and verification:
 - .1 Refer to Section 01 47 17: Sustainable Requirements: Contractor's Verification.
- .2 Related Sections:
 - .1 Section 01 33 00 – Submittal Procedures.
 - .2 Section 01 47 13 – LEED Requirements.
 - .3 Section 01 47 17 – Sustainable Requirements: Contractor's Verification.
 - .4 Section 01 74 11 – Cleaning.
 - .5 Section 01 74 19 – Construction/Demolition Waste Management and Disposal.
 - .6 Section 01 78 00 – Closeout Submittals.
 - .7 Section 01 91 13 – General Commissioning (Cx) Requirements.
 - .8 Section 23 11 00 – Energy Supply.
 - .9 Section 23 05 00 – Design Requirements – HVAC
 - .10 Division 25 – Integrated Automation.
 - .11 Division 26 – Electrical

1.2**REFERENCES**

- .1 American Boiler Manufacturer's Association (ABMA)
- .2 American National Standards Institute (ANSI)/Canadian Standards Association (CSA)
 - .1 ANSI Z21.13-2010/CSA 4.9-2010, Gas-Fired Low-Pressure Steam and Hot Water Boilers.
- .3 American Society of Heating, Refrigeration and Air Conditioning Engineers (ASHRAE)
- .4 American Society of Mechanical Engineers (ASME) Codes
- .5 American Society for Testing and Materials International (ASTM)
 - .1 ASTM A 53/A 53M-07, Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless.
 - .2 ASTM A 106-08, Standard Specification for Seamless Carbon Steel Pipe for High-Temperature Service.
- .6 Manitoba Workplace Safety and Health / Workplace Hazardous Materials Information System (WHMIS)
 - .1 Material Safety Data Sheets (MSDS).
- .7 National Electrical Manufacturers Association (NEMA)
 - .1 ANSI/NEMA MG 1-2006, Rev. 1, Motors and Generators.
 - .2 NEMA 250-2008, Enclosures for Electrical Equipment (1000 Volts Maximum).
- .8 National Fire Protection Association (NFPA)
 - .1 NFPA 90A-2009, Standard for the Installation of Air Conditioning and Ventilating Systems.
 - .2 NFPA 255-2006, Standard Method of Test of Surface Burning Characteristics of Building Materials.
- .9 Underwriters Laboratories of Canada (ULC)
 - .1 CAN/ULC-S102-07, Standard Method of Test for Surface Burning Characteristics of Building Materials and Assemblies.

1.3**DESIGN REQUIREMENTS**

- .1 Piping: size piping and fittings to ASHRAE pipe sizing standards, to maintain conditions specified by equipment manufacturers.

- .2 Performance Requirements: ANSI Z21.13/CSA 4.9 testing procedures.
- .3 Design Heating Capacity:
 - .1 Hot Water: sufficient in temperature and capacity to meet maximum design load +10% safety factor.

1.4 SUBMITTALS

- .1 Submittals in accordance with Section 01 33 00 – Submittal Procedures.
- .2 Product Data:
 - .1 Submit manufacturer's printed product literature, specifications and datasheet for Boilers, Pumps and Auxiliary Equipment.
- .3 Submit WHMIS MSDS in accordance with Section 01 33 00 – Submittal Procedures. Indicate VOC's for adhesive and solvents during application and curing.
- .4 Submit complete start-up report indicating start-up and system verification sequences.
- .5 Instructions: submit manufacturer's installation instructions.

1.5 QUALITY ASSURANCE

- .1 Provide products from same manufacturer.
- .2 Provide equipment with required ASME plate and stampings.
- .3 Utilize design and installation personnel thoroughly familiar with systems of this type.
- .4 Health and Safety:
 - .1 Do construction occupational health and safety in accordance with Manitoba Workplace Safety and Health Requirements.
- .5 COR Certification:
 - .1 All members of the design/build team are to be COR Certified to participate in the design, construction and commissioning.
- .6 Verification: contractor's verification in accordance with Section 01 47 17 – Sustainable Requirements: Contractor's Verification

Part 2 Products

2.1 MATERIALS

- .1 Sustainable Design: Refer to Section 01 47 13 – LEED Requirements.
- .2 Pumps:
 - .1 Materials: API 610, ASME.
 - .2 Motor: ANSI/NEMA MG 1.
- .3 Insulation:
 - .1 Maximum flame spread 25 maximum smoke developed 50 to CAN/ULC S102.
 - .2 Adhesives, sealers, vapour coating, mastics, laggings and bedding: material which does not soften, corrode or deteriorate in wet or dry state, of type recommended by insulation manufacturer for the proposed application.
 - .3 Provide low odour, low volatile organic compound (VOC) materials.

2.2 BOILERS

- .1 Boiler: ANSI Z21.13/CSA 4.9, type and size to meet design heating requirements, burner with ULC and CSA label.
- .2 Efficiency: minimum 90% from 25% to 100% of maximum continuous firing rate, fully condensing.
- .3 Size to be a minimum of 70% of the total load each for duplex boilers.
- .4 Accessories: piping, valves, condensate neutralizer and accessories to achieve a complete heating system, with connections to energy supply piping and heat distribution piping.
- .5 Insulate to maintain maximum equipment skin temperature of 70°C at ambient room temperature of 32°C, and comply with ASHRAE 90.1 energy efficiency.

- .6 Control System:
 - .1 Packaged controls with outdoor air temperature sensor for reset control. Provide for pump interlock and low flow switch to meet required safety shutdown requirements.
 - .2 Enclosure: to NEMA 250, Type 1.
 - .3 Alarms: electronic, audible, for high temperature and low water level, and with full interface to BAS system using N2 Open or BACnet Protocols. LON protocol will not be accepted.
- .7 Gauges: pressure and temperature, on fluid in and out connections, and at critical internal conditions.
- .8 Burner Safeguards.
 - .1 Provide burner safety system for generators.
 - .2 Monitor for boiler, burner and auxiliary equipment failure, and operator error. Take corrective or preventative action. Monitor start-up, shut-down and operation through generator operating range to prevent unsafe operation.
 - .3 Control: microprocessor based, with plug-in modules, compatible with combustion control systems. Bypass logic with hardwired emergency boiler trip circuit.
 - .4 Flame scanners: monitor igniter flame and main flame.
 - .5 Pressure regulators: for pilot, main burner supply pressure, and gas pressure.

- 2.3 INDIRECT FIRED RADIANT TUBE HEATERS**
 - .1 Provide vacuum type radiant tube heaters with aluminized Steel reflectors, burner section, vacuum fan/pump, and discharge chimney sections.
 - .1 Use for quick temperature recovery in shop and vehicle storage garage areas.
 - .2 Where height is available for proper spacing from occupants and equipment.
 - .3 Refer to Section 23 82 00 – Terminal and Packaged Units.

- 2.4 MAKE-UP AIR UNITS**
 - .1 Provide direct-fired make-up air units as packaged natural gas-fired units as required in Section 23 82 00 – Terminal and Packaged Units.

- Part 3 Execution**
- 3.1 MANUFACTURER'S INSTRUCTION**
 - .1 Compliance: comply with manufacturer's written recommendations or specifications, including product technical bulletins, handling, storage and installation instructions, and datasheet.

- 3.2 INSTALLATION**
 - .1 Install equipment according to manufacturer's instructions.
 - .2 Install equipment on pads which extend beyond equipment base minimum 100 mm.
 - .3 Operate equipment at best efficiency points.
 - .4 Install insulation to NFPA 90A.
 - .5 Provide insulation to boiler, heat exchangers, expansion tank, pumps, piping and valves to manufacturer recommendations and TIAC Standards.
 - .6 Provide gas, heating water and glycol solution, piping, control valves, isolation valves, from point of service connection to heat generator.
 - .7 Provide lightning protection on chimney stack.
 - .8 Connect breeching from boiler outlet to chimney.
 - .9 Provide flexible isolation fittings between suction and discharge of pumps and associated piping.

- 3.3 FIELD QUALITY CONTROL**
 - .1 Verification:

- .1 Operate equipment and verify that performance criteria specified in this section has been achieved.
- .2 Verification requirements in accordance with Section 01 47 13 – LEED Requirements.

3.4 DEMONSTRATION

- .1 Demonstrate equipment of this section to the Contract Administrator.
- .2 After hot water generator has been in operation for two weeks, provide experienced and qualified boiler, burner and combustion control system manufacturer representatives to demonstrate boiler operating capability.
- .3 Provide training and instructions to boiler operators, including burner control and safety systems, piping system components, valves, pumps and controls.

3.5 COMMISSIONING

- .1 Commission equipment to 01 91 13 – General Commissioning (Cx) Requirements.
- .2 Test and adjust boiler for capacity and efficiency to ASME standard short form.
 - .1 Prove guaranteed efficiencies at 50% and 100% load.
 - .2 Operate boiler with automatic combustion controls in manual mode.
 - .3 Fuel, water, chemicals, power and heating load will be supplied by the Contract Administrator.

3.6 CLEANING

- .1 Perform cleaning operations as specified in Section 01 74 11 – Cleaning and in accordance with manufacturer's recommendations.
- .2 On completion and verification of performance of installation, remove surplus materials, excess materials, rubbish, tools and equipment.

END OF SECTION

Part 1**General****1.1****SUMMARY**

- .1 Section Includes:
 - .1 Materials and installation for:
 - .2 Air distribution systems.
 - .3 Hydronic distribution systems.
 - .4 Other HVAC distribution systems.
- .2 Sustainable requirements for construction and verification.
 - .1 Section 01 47 17 – Sustainable Requirements: Contractor’s Verification.
- .3 Related Sections:
 - .1 Section 01 33 00 – Submittal Procedures.
 - .2 Section 01 47 13 – LEED Requirements.
 - .3 Section 01 47 17 – Sustainable Requirements: Contractor’s Verification.
 - .4 Section 01 74 11 – Cleaning.
 - .5 Section 01 74 19 – Construction Waste Management and Disposal.
 - .6 Section 01 78 00 – Closeout Submittals.
 - .7 Section 01 91 13 – General Commissioning (Cx) Requirements.
 - .8 Section 23 05 00 – Design Requirements – HVAC
 - .9 Division 25 – Integrated Automation
 - .10 Division 26 – Electrical

1.2**REFERENCES**

- .1 Air Moving and Control Association International, Inc. (AMCA)
- .2 Air-Conditioning, Heating and Refrigeration Institute (AHRI)
- .3 American Society of Heating, Refrigeration and Air Conditioning Engineers (ASHRAE)
 - .1 ASHRAE 90.1-01, Energy Standard for Buildings Except Low-Rise Residential Buildings.
- .4 American Society for Testing and Materials International (ASTM)
 - .1 ASTM A 53/A 53M-07, Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless.
- .5 Manitoba Workplace Safety and Health Workplace Hazardous Materials Information System (WHMIS)
 - .1 Material Safety Data Sheets (MSDS).
- .6 National Fire Protection Association (NFPA)
 - .1 NFPA 90A-2009, Standard for the Installation of Air Conditioning and Ventilating Systems.
 - .2 NFPA 96-2008, Standard for Ventilation Control and Fire Protection of Commercial Cooking Operations.
- .7 National Electrical Manufacturers Association (NEMA)
 - .1 NEMA MG 1-2006, Motors and Generators.
- .8 Sheet Metal and Air Conditioning Contractors National Association (SMACNA)
 - .1 SMACNA - HVAC Duct Construction Standards - Metal and Flexible, 2nd edition, 1995.
- .9 Underwriters Laboratories of Canada Inc. (ULC).

1.3**DESIGN REQUIREMENTS**

- .1 Provide complete and operational HVAC and water system, designed to achieve desired space environment criteria.
- .2 Use heat recovery equipment in project HVAC design.
- .3 Size air handling units for the offices areas to provide variable volume design air supply volume and pressures. Provide variable volume operation through use of variable frequency drives on motors. Select fans and motors to match variable frequency drive. Air delivery to shop areas is to be constant volume.

- .4 Pumps and Fans: select fans for optimum efficiency over the design operating pressure range.
- .5 Pipe Sizing: calculate sizes to ASHRAE guidelines.
- .6 Duct Sizing: perform duct sizing calculations in accordance with ASHRAE guidelines. All duct design to conform to ASHRAE guidelines and SMACNA Standards.
- .7 Acoustics:
 - .1 Select equipment, to meet or exceed design sound level control requirements.

1.4 SUBMITTALS

- .1 Submittals in accordance with Section 01 33 00 – Submittal Procedures.
- .2 Co-ordinate submittal requirements and provide submittals required by Section 01 47 17 – Sustainable Requirements: Contractor's Verification.
- .3 Product Data:
 - .1 Submit manufacturer's printed product literature, specifications and datasheet for heating, ventilation and air conditioning distribution piping and ductwork.
 - .2 Submit WHMIS MSDS in accordance with Section 01 33 00 – Submittal Procedures. Indicate VOC's for adhesive and solvents during application and curing.
- .4 Submit complete life cycle costing analysis of alternative steam and hot water distribution system proposals for the Contract Administrator's review.
- .5 Test Reports: submit certified test reports from approved independent testing laboratories indicating compliance with specifications for specified performance characteristics and physical properties.
- .6 Certificates: submit certificates signed by manufacturer certifying that materials comply with specified performance characteristics and physical properties.
- .7 Instructions: submit manufacturer's installation instructions.
- .8 Manufacturer's Field Services: submit reports within three days of receipt from manufacturer.
- .9 Closeout submittals: submit maintenance and engineering data for incorporation into manual specified in Section 01 78 00 – Closeout Submittals include data as follows:
 - .1 Provide for equipment, manufacturer's name, type, year, number of units, and capacity.
 - .2 Submit complete start-up report indicating start-up and system verification sequences.

1.5 QUALITY ASSURANCE

- .1 Provide AMCA or AHRI certified equipment where possible.
- .2 Test air distribution ductwork to SMACNA Duct Leakage Test Manual. The Contract Administrator is to witness tests.
- .3 Equipment: similar functioning equipment from same manufacturer.
- .4 Utilize design and installation personnel thoroughly familiar with systems of this type.
- .5 Health and Safety:
 - .1 Do construction occupational health and safety in accordance with Manitoba Workplace Safety and Health Requirements.
- .6 COR Certification:
 - .1 All members of the design/build team are to be COR Certified to participate in the design, construction and commissioning.
- .7 Verification: contractor's verification in accordance with Section 01 47 17 – Sustainable Requirements: Contractor's Verification.

1.6 DELIVERY STORAGE AND HANDLING

- .1 Maintain equipment condition and cleanliness by protecting all openings and surfaces from fouling by dust, water, debris, corrosion, or vermin during delivery, storage and handling.

- .2 Materials damaged in transit or during storage and handling are to be replaced prior to installation.

Part 2 Products

2.1 MATERIALS

- .1 Materials and resources in accordance with Section 01 47 17 – Sustainable Requirements: Contractor's Verification.
- .2 Air Distribution System:
- .1 Duct: SMACNA HVAC Duct Construction Standards, Metal and Flexible. Use galvanized steel ductwork except as otherwise noted.
- .2 Dishwasher Exhaust Duct: stainless steel.
- .3 Wash bay supply air and exhaust ducts are to be made of aluminum for corrosion resistance.
- .4 Waterproof ducts upstream and downstream of humidifier units, and for fresh air intakes and wash bay exhaust.
- .5 Balancing Dampers: splitter dampers or balancing dampers where possible on larger main branches; duct balancing dampers on small branches. Use outlet balancing devices only where branch balancing is not possible.
- .6 Flexible Duct Connectors: maximum length 1.5 metres, ULC listed, rated for design system pressure.
- .7 Dampers - Operating:
- .1 Select size and type, based on AMCA certified performance ratings.
- .2 Blade profile to suit service, insulated when in envelope plane or handling outdoor air.
- .3 Seals: neoprene or low temperature silicone rubber blade and side seals to achieve maximum 1% air volume leakage at design temperature and system pressure, and to withstand and maximum design velocity.
- .4 Bearings: self-lubricating.
- .5 Linkage: sufficient strength and locations, allow motors to operate damper without causing structural damage or warping.
- .6 Motors: sufficient strength to operate dampers at greatest design load, of type compatible with air control system and damper design.
- .8 Dampers - Fire: ULC labelled, fusible link temperature rating to ULC listing and fire compartment rating.
- .9 Acoustic Treatment: silencers and acoustic duct lining, to meet specified sound levels.
- .3 Fluid Distribution System: Piping to ASTM A 53/A 53M.
- .1 Hot Water Distribution Piping: Schedule 40 steel.
- .4 Terminal Devices:
- .1 Convectors:
- .1 Convectors: coil unit with items inside a baked enamel, sheet metal cabinet.
- .2 Equip units with sheet metal enclosures.

2.2 AIR HANDLING EQUIPMENT

- .1 Air Handling Units (AHU): AMCA Certified.
- .1 Cabinet: Industrial quality, rust-resistant construction, hinged and gasketed access doors, acoustically lined casing with inner skin to prevent lining separation.
- .2 Fans: statically and dynamically balanced, centrifugal type. Select bearings for average life of minimum 150,000 hours, with lubrication fittings extended to side of unit for convenient servicing. Provide internal vibration isolation for fans.
- .3 Filters: ULC Class 2, disposable. Maximum design face velocity: 2.5 m/s. Provide MERV 8 pre-filters and MERV 13 after filters if required to maintain air cleanliness design parameters. Provide local filter pressure drop gauges for each filter.
- .4 Coils: AHRI rated, maximum design face velocity for cooling coils: 2.5 m/s.

- .5 Drain Pans: stainless steel or non-ferrous, externally insulated, sloped to drain at low point. Install deep seal P trap on drain line.
- .6 Provide drives with motors, adjustable motor slide rail base, adjustable sheaves, belts and belt guards.
- .7 Include mixing box sections where applicable, with air blenders to achieve uniform mixing.
- .8 Sheaves: provide one spare set, of size and type determined by the Air Balancing firm.
- .9 Provide AHRI seal on units larger than 40 kW.
- .10 Provide N2 Open or BACnet protocol packaged control system with unit, factory wired, and BAS interface pre-programmed and tested for connection to BAS required in Division 25 – Integrated Automation.
- .2 Ventilation and Exhaust System:
 - .1 Equipment: AMCA Certified.
 - .2 Select fans to provide minimum 20% excess design capacity by changing sheaves.

2.3 FLUID DISTRIBUTION SYSTEM

- .1 General:
 - .1 Piping: provide piping materials recommended by ASHRAE for associated medium.
 - .2 Insulation: size and type required to maintain design temperature at every outlet, and maintain surface temperature below 70°C and at least 5°C above indoor air dewpoint.
 - .3 Allow for system thermal expansion, to prevent structural failure or fluid leakage.
 - .4 Install various HVAC distribution piping along similar routing where possible, to share pipe support structures. Locate pipe labels in similar locations.
- .2 Hot Water Distribution System:
 - .1 Provide hot water distribution piping from equipment to terminal units as required.
 - .2 Insulation: as required to maintain design temperature at every outlet, and maintain surface temperature below 70°C.
- .3 Chilled Water Distribution System:
 - .1 Chilled water distribution piping to follow same routing as steam or hot water piping from source to mechanical room.
 - .2 Insulation: as required to maintain design temperature at every outlet, and maintain a surface temperature at least 5°C above indoor air dewpoint at maximum design saturation.

2.4 PUMPS

- .1 Hot Water Heating Pumps:
 - .1 Provide pumps to circulate hot water from hot water supply appliances through glycol heat exchangers on systems exposed to outdoor air and back to hot water return pipe.
 - .2 Provide minimum two pumping units rated at 100% system capacity each.
 - .3 Design maximum inlet hot water temperature at pumps 82°C.
 - .4 Select pump so that the first critical speed is minimum 125% greater than design operating speed.
- .2 System Distribution Pumps:
 - .1 Provide system distribution pumps to pump hot water from hot water supply pipe through hot water distribution system and back to hot water return pipe.
 - .2 Provide two pumping units sized for 100% capacity each. Pumps will operate as duty and standby as controlled through the BAS. Provide variable speed control to operate from 200 to 1750 rpm.
 - .3 Select pump performance curve to pass through system design operating point.

- .4 Provide single pump control for operation along system curve by varying pump speeds using variable frequency drives.
- .5 Control pump speeds by monitoring distribution system pressure.
- .6 Select pump curves for best efficiency, parallel to system head curve.
- .7 Motors:
 - .1 Suitable for use with variable frequency drive, NEMA design B and class F insulation, to NEMA MG1 Part 31 Definite-Purpose Inverter-fed Motors.
 - .2 Maximum motor and pump speed: 1750 rpm.
 - .3 Power: 575 volts, 3 phase.
- .8 Variable Frequency Drive (VFD):
 - .1 Suitable for this application and for use in normal indoor non-hazardous environments.
 - .2 Provide variable speed control of motors.

2.5 TERMINAL DEVICES

- .1 General:
 - .1 Provide air and water terminal devices, sized and located to achieve desired design environment.
 - .2 Provide similar equipment from one manufacturer.
- .2 Perimeter radiation: mount cabinet below exterior window or on inside of exterior wall to suit application in office spaces. Size to offset envelope losses.
- .3 Variable and Constant Volume Terminal Units:
 - .1 Size and capacity to achieve design air flow. Select and locate units to achieve zone control as specified.
 - .2 Control System: direct digital controllers.
 - .3 Operation: duct pressure independent air flow control between zero volume and maximum volume.
 - .4 Acoustic Lining: UL 181 and NFPA 90A.
- .4 Duct Accessories:
 - .1 Dampers - Balancing:
 - .1 Splitter dampers: material and hardware of thickness and structural strength to withstand design duct velocity and pressures without failure.
 - .2 Balancing dampers: capable of maintaining maximum air leakage of 5% design flow in fully closed position at design operating duct pressure.
 - .2 Dampers - Fire: type B or C, for horizontal or vertical operation as applicable, ULC listed.
 - .3 Registers, Grilles and Diffusers: use equipment from manufacturers with published data tested to AMCA standards. Do not use terminal dampers unless volume control cannot be achieved with duct devices.
- .5 Hydronic System:
 - .1 Select pipe size and material for fluid medium, and design conditions.
 - .2 Select pipe and equipment to ASHRAE 90.1.
 - .3 Provide drain capability at low points, auto vents for high points.
 - .4 Locate isolation valves at branches, at connection to equipment, and at flow control and balancing valves to permit draining for service. Balancing valves do not count as isolation valves.
 - .5 Provide flexible connections and vibration isolation supports and hangers at connection to equipment. Do not support piping from equipment.
 - .6 Protect equipment and components against freezing. Where the terminal equipment will be exposed to temperatures below 0°C in normal or upset operating conditions, use water to glycol heat exchangers and provide pumps to circulate a secondary loop of propylene glycol and water solution freezing point that is below the winter design temperature freezing point.
 - .7 Provide for chemical cleaning of piping.
 - .8 Provide isolation at connections between different materials.
 - .9 Provide stand by-pumps for primary systems.
 - .10 Provide means to add chemicals and glycol to systems in operation.

- .11 Insulate as per table in ASHRAE 90.1. Surface temperature of insulation shall not exceed 70°C at any point.
- .6 Vibration Isolation: vibration isolation equipment manufacturer's recommendations.

Part 3 Execution

3.1 MANUFACTURER'S INSTRUCTIONS

- .1 Compliance: comply with manufacturer's written recommendations or specifications, including product technical bulletins, handling, storage and installation instructions, and datasheet.

3.2 INSTALLATION

- .1 Install equipment to manufacturer's written instructions.
- .2 Air Distribution System:
 - .1 Ducts:
 - .1 Galvanized steel or aluminum ducts to SMACNA HVAC Duct Construction, Standards, Metal and Flexible.
 - .2 Insulate fresh air intakes and exhaust ducts a minimum of 3 m from exhaust louver.
 - .2 Ventilation and Exhaust System:
 - .1 Galvanized steel or aluminum to SMACNA HVAC Duct Construction Standards, Metal and Flexible.
 - .2 During testing and balancing be prepared to change sheaves if required to provide required airflow as per Room Data Sheets.
 - .3 Insulate fresh air intake and exhaust ducts sufficiently to prevent sweating at coldest design exterior conditions.
- .3 Fluid Distribution Systems: to manufacturer's recommendations.
- .4 Duct Accessories: install fire dampers to local code requirements.
- .5 Piping:
 - .1 Install to conserve space in buildings and to keep furring to a minimum.
 - .2 Slope piping up in direction of flow to high point vents. Provide drain valves with hose thread and cap with chain at low points in system.
 - .3 Provide dielectric isolation of dissimilar metals.
 - .4 Provide expansion loops or swing joints to compensate for thermal expansion. Use expansion joints where space is limited.
- .6 General:
 - .1 Install equipment as per manufacturer's written direction.
 - .2 Vibration Isolation:
 - .1 Install vibration isolation at connections between piping and pumps
 - .2 Install vibration isolation between all motor driven fans and equipment and the services, ducts, piping and supports that connect to them.
 - .3 Install vibration isolation devices as recommended by equipment manufacturer.
 - .3 Install insulation as required.

3.3 FIELD QUALITY CONTROL

- .1 Verification requirements in accordance with Section 01 47 17 – Sustainable Requirements: Contractor's Verification, include:
 - .1 Materials and resources.
 - .2 Storage and collection of recyclables.
 - .3 Construction waste management.
 - .4 Resource reuse.
 - .5 Recycled content.
 - .6 Local/regional materials.
 - .7 Certified Wood.

-
- .8 Low-emitting materials.
 - .2 Performance Verification:
 - .1 Operate equipment and verify that performance criteria specified in this section has been achieved.
 - .2 Coordinate with the timing of commissioning specified in Section 01 91 13 – General Commissioning (Cx) Requirements.
- 3.4 COMMISSIONING**
- .1 Commission equipment to Section 01 91 13 – General Commissioning (Cx) Requirements.
 - .2 Test and adjust pumps, air handling units, fans. Prove that equipment operates in manufacturer's published operating range for selected model, and as specified in Section 23 05 93 – Testing, Adjusting and Balancing for HVAC.
- 3.5 CLEANING**
- .1 Perform cleaning operations as specified in Section 01 74 11 – Cleaning and in accordance with manufacturer's recommendations.
 - .2 On completion and verification of performance of installation, remove surplus materials, excess materials, rubbish, tools and equipment.

END OF SECTION

Part 1**General****1.1****SUMMARY**

- .1 Section Includes:
 - .1 Materials and installation for:
 - .1 Direct Expansion Systems.
 - .2 Refrigeration Piping.
 - .3 Sustainable requirements for construction and verification.
 - .1 Section 01 47 13 – LEED Requirements.
- .2 Related Sections:
 - .1 Section 01 33 00 – Submittals Procedures.
 - .2 Section 01 47 13 – LEED Requirements.
 - .3 Section 01 47 17 – Sustainable Requirements: Contractor's Verification.
 - .4 Section 01 74 11 – Cleaning.
 - .5 Section 01 74 19 – Construction Waste Management and Disposal.
 - .6 Section 01 78 00 – Closeout Submittals.
 - .7 Section 01 91 13 – General Commissioning (Cx) Requirements.
 - .8 Section 23 30 00 – HVAC Distribution.
 - .9 Section 23 82 00 – Terminal and Packaged units.
 - .10 Section 23 84 00 – Other HVAC Systems and Equipment.
 - .11 Division 25 – Integrated Automation.
 - .12 Division 26 – Electrical.

1.2**REFERENCES**

- .1 Air-Conditioning, Heating and Refrigeration Institute (AHRI)
 - .1 AHRI 275-2009, Application of Sound Rating Levels of Outdoor Unitary Equipment.
- .2 American Society of Heating, Refrigeration and Air Conditioning Engineers (ASHRAE)
 - .1 ASHRAE 90.1-2007, Energy Standard for Buildings Except Low-Rise Residential Buildings.
 - .2 ASHRAE 15-01, Safety Standard Refrigeration Systems.
- .3 American Society of Mechanical Engineers (ASME)
 - .3 ASME B31.5-2006, Refrigeration Piping and Heat Exchanger Components.
- .4 American Society for Testing and Materials International (ASTM)
 - .1 ASTM B 280-08, Standard Specification for Seamless Copper Tube for Air Conditioning and Refrigeration Field Service.
- .5 Canadian Standards Association (CSA International)
 - .1 CSA B52-2005, Mechanical Refrigeration Code.
 - .2 CSA O80 Series-08, Wood Preservation.
- .6 Environment Canada (EC)
 - .1 EPS 1/RA/2-96, Environmental Code of Practice for Elimination of Fluorocarbon Emissions from Refrigeration and Air Conditioning Systems.
- .7 Manitoba Workplace Hazardous Materials Information System (WHMIS)
 - .1 Material Safety Data Sheets (MSDS).
- .8 Manitoba Labour – Mechanical Engineering Branch

1.2**DESIGN REQUIREMENTS**

- .1 Design Calculations:
 - .1 Provide equipment, piping and accessories to provide refrigeration capacity required to maintain indoor air conditions as specified.
 - .2 Follow design guidelines and select equipment to guidelines in the EC - Environmental Code of Practice.
- .2 Direct Expansion Systems: minimum performance standard: ASHRAE 90.1.
- .3 Insulation: sufficient insulating value to prevent sweating of piping system at ambient temperature of 32°C at 50% RH, and provide minimum thermal performance of 0.9 RSI value.

1.3 SUBMITTALS

- .1 Submittals in accordance with Section 01 33 00 – Submittal Procedures.
- .2 Co-ordinate submittal requirements and provide submittals required by Section 01 47 13 – LEED Requirements.
- .3 Product Data:
 - .1 Submit manufacturer's printed product literature, specifications and datasheet for Compressors and Auxiliary Equipment.
- .4 Submit WHMIS MSDS in accordance with Section 01 47 13 – LEED Requirements. Indicate VOCs for adhesive and solvents during application and curing.
- .5 Test Reports: submit certified test reports from approved independent testing laboratories indicating compliance with specifications for specified performance characteristics and physical properties.
- .6 Certificates: submit certificates signed by manufacturer certifying that materials comply with specified performance characteristics and physical properties.
- .7 Instructions: submit manufacturer's installation instructions.
- .8 Manufacturer's Field Services: submit reports within three days of receipt from manufacturer.
- .9 Closeout Submittals: submit maintenance and engineering data for incorporation into manual specified in Section 01 78 00 – Closeout Submittals include data as follows:
 - .1 Indicate: brief description of heat generation equipment and components.
 - .2 Provide for units, manufacturer's name, type, year, number of units, and capacity.
 - .3 Submit complete start-up report indicating start-up and system verification sequences.

1.4 QUALITY ASSURANCE

- .1 Utilize Design and Installation personnel thoroughly familiar with systems of this type.
- .2 Provide multiple units from same manufacturer.
- .3 Health and Safety:
 - .1 Do construction occupational health and safety in accordance with Manitoba Workplace Safety and Health Requirements.
- .4 .5 COR Certification:
 - .1 All members of the design/build team are to be COR Certified to participate in the design, construction and commissioning.

1.5 DELIVERY, STORAGE AND HANDLING

- .1 Maintain equipment condition and cleanliness by protecting all openings and surfaces from fouling by dust, water, debris, corrosion, or vermin during delivery, storage and handling.
- .2 Materials damaged in transit or during storage and handling are to be replaced prior to installation.

Part 2 Products

2.2 MATERIALS

- .1 Sustainable Design: Refer to Section 01 47 13 – LEED Requirements.
- .2 Outdoor Steel Supports and Ladders: hot dipped galvanized steel.
- .3 Insulation: suitable type and thickness to meet design requirements, with vapour barrier.

2.3 DIRECT EXPANSION SYSTEMS

- .1 Equipment: AHRI rated.
- .2 Condensers: air cooled with separate circuit for compressor/evaporator combination.
- .3 Support: ensure support on roof structure for roof mounted units. Provide access for maintenance.
- .4 Controls (Operating and Safety): manufacturer's standard.
- .5 Outdoor Cabinet: tested and AGA certified.
- .6 Soundproofing: AHRI 275 at one metre, in free field.

- .7 Refrigeration Piping:
 - .1 Materials: CSA B52 and ASTM B 280.
 - .2 Connect equipment with isolation valves and unions, sized in accordance with manufacturers recommendations and ASHRAE sizing guidelines.

Part 3 Execution

3.2 MANUFACTURER'S INSTRUCTIONS

- .1 Compliance: comply with manufacturer's written recommendations or specifications, including product technical bulletins, handling, storage and installation instructions, and datasheet.

3.3 INSTALLATION

- .1 Install equipment to manufacturer's written instructions.
- .2 Provide piping and insulation to meet local code requirements.
- .3 Ensure or provide necessary structural support for large, heavy equipment.
- .4 Install outdoor equipment on supports approved by manufacturer. Provide additional structural support required.
- .5 Provide for access to outdoor units for maintenance and repair.
- .6 Insulate refrigeration piping, to equipment manufacturer's recommendations.

3.4 FIELD QUALITY CONTROL

- .1 Field Tests: conduct tests required to Comply with CSA-B52 and the Steam and Pressure Plants Act/Regulation 108/87R. Pay all fees levied by the Authority Having Jurisdiction for inspection and witness testing.
- .2 Verification requirements in accordance with Section 01 47 17 – Sustainable Requirements: Contractor's Verification, include:
 - .1 Materials and resources.
 - .2 Storage and collection of recyclables.
 - .3 Construction waste management.
 - .4 Resource reuse.
 - .5 Recycled content.
 - .6 Local/regional materials.
 - .7 Certified wood.
 - .8 Low-Emitting materials.
- .3 Performance Verification:
 - .1 Operate equipment and verify that performance criteria specified in this section has been achieved.
 - .2 Perform periodic site inspection visits by manufacturer's representative to verify that installation complies with manufacturer's instructions:
 - .1 After delivery and storage of products.
 - .2 When preparatory Work upon which product installation depends is complete.
 - .3 Twice during installation progress at 25% and 60% complete.
 - .4 After installation and cleaning is complete.

3.5 DEMONSTRATION

- .1 Demonstrate equipment to the Contract Administrator and designated maintenance staff and provide documentation of who was present and what was demonstrated.
- .2 After chiller has been in operation for two weeks, provide experienced and qualified manufacturer representatives to demonstrate chiller operating capability.
- .3 Provide training and instructions to operators, including control and safety systems.

3.6 COMMISSIONING

- .1 Commission equipment to 01 91 13 – General Commissioning (Cx) Requirements.
- .2 Test and adjust chiller to verify selected manufacturer's design capacity.

3.7

CLEANING

- .1 Perform cleaning in accordance with Section 01 74 11 – Cleaning and in accordance with manufacturer's recommendations.
- .2 Upon completion and verification of performance of installation, remove surplus materials, excess materials, rubbish, tools and equipment.

END OF SECTION

Part 1**General****1.1****SUMMARY**

- .1 Section Includes:
 - .1 Materials and installation for:
 - .1 Unit Heaters, Hydronic and Gas Fired.
 - .2 Make Up Air Units.
 - .3 Infrared Radiant Heating.
 - .2 Sustainable requirements for construction and verification.
 - .1 Energy efficiency.
 - .2 Comfort and control.
- .2 Related Sections:
 - .1 Section 01 33 00 – Submittal Procedures.
 - .2 Section 01 47 13 – LEED Requirements.
 - .3 Section 01 47 17 – Sustainable Requirements: Contractor's Verification.
 - .4 Section 01 74 11 – Cleaning.
 - .5 Section 01 74 19 – Construction Waste Management and Disposal.
 - .6 Section 01 78 00 – Closeout Submittals.
 - .7 Section 01 91 13 – General Commissioning (Cx) Requirements.
 - .8 Section 23 05 00 – Design Requirements – HVAC.
 - .9 Section 23 05 93 – Testing, Adjusting and Balancing for HVAC.

1.2**REFERENCES**

- .1 Air Moving and Control Association International, Inc. (AMCA)
 - .1 AMCA 210-99, Laboratory Methods of Testing Fans for Aerodynamic Performance Rating.
- .2 American National Standards Institute (ANSI)
 - .1 ANSI Z83.19-2009/CSA 2.35-2009, Gas-Fired High-Intensity Infrared Heaters.
 - .2 ANSI Z83.20-2008/CSA 2.34-2008, Gas-Fired Low-Intensity Infrared Heaters.
- .3 Air-Conditioning Heating and Refrigeration Institute (AHRI)
 - .1 AHRI 430-2009, Central Station Air-Handling Units.
- .4 American Society of Heating, Refrigeration and Air Conditioning Engineers (ASHRAE)
 - .1 ASHRAE 90.1-2007, Energy Standard for Buildings Except Low-Rise Residential Buildings.
- .5 Canadian Standards Association (CSA International)
 - .1 CAN/CSA B149.1-05, Natural Gas and Propane Installation Code.
 - .2 CSA O80 Series-08, Wood Preservation.
- .6 Manitoba Workplace Safety and Health, Workplace Hazardous Materials Information System (WHMIS)
 - .1 Material Safety Data Sheets (MSDS).
- .7 National Fire Protection Association (NFPA)
 - .1 NFPA 90A-2009, Standard for the Installation of Air Conditioning and Ventilating Systems.
 - .2 NFPA 90B-2009, Standard for the Installation of Warm Air Heating and Air Conditioning Systems.

1.3**DESIGN REQUIREMENTS**

- .1 Select equipment to maintain design space environmental requirements.
- .2 Select and design terminal and packaged units to meet full design load. Provide heating and cooling calculations to the Owner's Advisor for review.
- .3 Select and size equipment to operate at best efficiency points, to ASHRAE 90.1.
- .4 Do not use electric space heaters.
- .5 Use gas fired unit heaters when hydronic unit heaters are not practical.

1.4**SUBMITTALS**

- .1 Submittals in accordance with Section 01 33 00 – Submittal Procedures.
- .2 Co-ordinate submittal requirements and provide submittals required by Section 01 47 17 – Sustainable Requirements: Contractor's Verification.

- .3 Product Data:
 - .1 Submit manufacturer's printed product literature, specifications and datasheet for self-contained (packaged) heating, cooling or ventilation units.
 - .2 Submit WHMIS MSDS in accordance with Section 01 47 15 – Sustainable Requirements: Contractor's Verification. Indicate VOC's for adhesive and solvents during application and curing.
 - .4 Instructions: submit manufacturer's installation instructions.
 - .5 Manufacturer's Field Services: submit reports within 3 days of receipt from manufacturer.
 - .6 Closeout submittals: submit maintenance and engineering data for incorporation into manual specified in Section 01 78 00 – Closeout Submittals include data as follows:
 - .1 Indicate: brief description of self-contained (packaged) heating, cooling or ventilation units.
 - .2 Provide for units, manufacturer's name, type, year, number of units, and capacity.
 - .3 Submit complete start-up report indicating start-up and system verification sequences.
 - .4 Submit manufacturer's standard warranty, executed by authorized company official.
- 1.5 QUALITY ASSURANCE**
- .1 Utilize design and Installation personnel thoroughly familiar with system of this type.
 - .2 Provide products from one manufacturer.
 - .3 Health and Safety:
 - .1 Do construction occupational health and safety in accordance with Manitoba Workplace Safety and Health requirements.
 - .4 COR Certification:
 - .1 All members of the design/build team are to be COR certified to participate in the design, construction and commissioning.
 - .5 Verification: contractor's verification in accordance with Section 01 47 17 – Sustainable Requirements: Contractor's Verification.
- 1.6 DELIVERY, STORAGE AND HANDLING**
- .1 Maintain equipment condition and cleanliness by protecting all openings and surfaces from fouling, by dust, water, debris, corrosion, or vermin during delivery, storage and handling.
 - .2 Materials damaged in transit or during storage or handling are to be replaced prior to installation.
- Part 2 Products**
- 2.1 UNIT HEATERS**
- .1 Hydronic:
 - .1 Casings: steel with gloss enamel finish.
 - .2 Coils: seamless copper tubing, silver brazed to copper or steel headers with evenly spaced aluminum fins mechanically bonded to tubing.
 - .3 Fan: factory balanced with anti-corrosive finish and fan guard.
 - .4 Motor: rated for continuous duty, with overload protection and resilient supports.
 - .2 Gas Fired: CGA certified.
 - .1 Casings: steel with glossed enamel finish.
 - .2 Heat Exchanger: tubular, indirect fired, force vented, laboratory life cycle tested.
 - .3 Fan: factory balanced with anti-corrosive finish and fan guard.
 - .4 Motor: rated for continuous duty, with built in overload protection and resilient supports.
- 2.2 MAKE UP AIR UNITS**
- .1 Units: CSA certified to AHRI 430, with AHRI seal.
 - .2 Components: fan section with motor and drive, filter section, dampers heating coil, cooling coil, humidifier, and mixing box.
 - .3 Controls: electronic, hardwire interlock with exhaust fan.

- .4 Casing:
 - .1 Material: galvanized steel reinforced and braced for rigidity.
 - .2 Lining: acoustically lined, reinforced with inner skin to prevent separation at design air velocity.
 - .3 Access: access doors, large enough to walk in for maintenance of internal parts.
- .5 Drain Pans: stainless steel. Do not use galvanized steel. Insulate to prevent sweating at design conditions. Locate drain connection in bottom at low point 75 mm minimum.
- .6 Fans:
 - .1 Type: centrifugal, selected to operate at stable part of performance curve at all times, with self aligning bearings.
 - .2 Motor: rated for continuous duty, with built in overload protection and resilient supports, complete with adjustable V-belt drive and guard.
- .7 Filter Box: material to match casing, filters to meet design air quality requirements.
- .8 Mixing Box: material to match casing, blade type and orientation designed to produce uniformly mixed air temperature within +/- 5°C of design across face of outlet.
- .9 Coils: AHRI certified.
 - .1 Capacity: to design requirements.
 - .2 Casings: 1.5 mm thick galvanized sheet steel. Supports of galvanized steel channel insulated sandwich construction.
 - .3 Glycol, Hot and Chilled Water Coils: Cleanable fins, pressure tested to 1.7 MPa.
 - .4 Direct Expansion Refrigerant Coils: arranged to prevent trapping of oil, with distributors to ensure even distribution of liquid refrigerant to circuits, pressure tested to Canadian Refrigeration Code, dehydrated and sealed with nitrogen charge before sending to site.
- .10 Humidifier: type and size to achieve design space humidity requirements. Locate injectors where air can absorb discharged vapour before it comes into contact with air distribution components or equipment. Perform psychrometric calculations to guidelines in ASHRAE Handbook Fundamentals.

2.3 INFRARED RADIANT HEATING

- .1 System: CSA certified, to ANSI Z83.19, ANSI Z83.20.
- .2 Components: burners; vents, vacuum exhausters; infrared emitters, shields, hangers and fittings, burner control modules; and system controls. Capable of operation while withstanding water spray from sprinklers.
- .3 Burners: suitable for natural gas, pre-wired safety controls at burners. Electrically interlock burners and vacuum exhausters.
- .4 Vacuum Exhauster: direct driven, dynamically balanced fan wheel, isolating mounts, bird screen at discharge. Protect housing and mounting parts with heat and water resistant coating.
- .5 Provide access for burners and exhausts for servicing.
- .6 Controls: electronic, by heater manufacturer.
- .7 Combustion Tube: minimum 1.6 mm aluminized steel.
- .8 Reflectors: aluminized steel.
- .9 Provide combustion air without the use of supplementary supply blowers or fans.

Part 3 Execution

3.1 MANUFACTURER'S INSTRUCTIONS

- .1 Compliance: comply with manufacturer's written recommendations or specifications, including product technical bulletins, handling, storage and installation instructions, and datasheet.

3.2 INSTALLATION

- .1 Install equipment to manufacturer's written instructions, NFPA 90A and NFPA 90B.
- .2 Supports:
 - .1 Locate outdoor equipment on supports recommended by manufacturer.
 - .2 Provide proper load bearing support.
 - .3 Steel supports and ladders used outdoors: metal coated to resist rusting, or wood treated to CSA O80.

- .3 Access: provide access to equipment for maintenance.
- .4 Unit Heaters:
 - .1 Install to manufacturer's written instructions.
 - .2 Hot Water Units:
 - .1 Install Ball valve on inlet and calibrated balancing valve with memory top on outlet of units. Install drain valve at low point. Install manual air vent at high point.
 - .2 Provide double swing pipe joints.
 - .3 Clean finned tubes and comb straight.
 - .4 Gas fired units: install B-vent exhaust gas flue to requirements of authorities having jurisdiction.
 - .5 Provide supplementary suspension as required.
 - .6 Mount thermostats on outside walls, using insulated backplates.
 - .7 Set discharge patterns and fan speeds to suit application.
- .5 Infrared Heaters:
 - .1 Provide heaters in locations where there is high degree of air infiltration including: loading areas, shops, vehicle repair bays, vehicle storage, vehicle wash bays).
 - .2 Due to high surface temperature during operation, do not use these units where atmosphere has high concentrations of: ignitable dust, flammable gases or flammable vapours. (e.g.: carpenter shop, battery room, degreasing operations).

3.3 FIELD QUALITY CONTROL

- .1 Verification requirements in accordance with Section 01 47 17 – Sustainable Requirements: Contractor's Verification include:
 - .1 Materials and resources.
 - .2 Storage and collection of recyclables.
 - .3 Construction waste management.
 - .4 Resource reuse.
 - .5 Recycled content.
 - .6 Local/regional materials.
 - .7 Certified wood.
 - .8 Low-emitting materials.
- .2 Performance Verification:
 - .1 Operate equipment and verify that performance criteria specified in this section has been achieved.
 - .2 Perform periodic site inspection visits by manufacturer's representative to verify that installation complies with manufacturer's instructions:
 - .1 After delivery and storage of products.
 - .2 After installation and cleaning is complete.
 - .3 Coordinate with the timing of the commissioning specified in Section 01 91 13 – General Commissioning (Cx) Requirements.

3.4 COMMISSIONING

- .1 Commission equipment to Section 01 91 13 – General Commissioning (Cx) Requirements.
- .2 Test and adjust unit heaters, make-up air units, and infrared radiant heating.

3.5 CLEANING

- .1 Perform cleaning operations as specified in Section 01 74 11 – Cleaning and in accordance with manufacturer's recommendations.
- .2 On completion and verification of performance of installation, remove surplus materials, excess materials, rubbish, tools and equipment.

Part 1

General

1.1

SECTION INCLUDES

- .1 Special cooling systems and devices.
- .2 Humidity control.
- .3 Dust and fume collectors.
- .4 Fans and equipment in corrosive areas.
- .5 Vehicle exhaust collection systems.

1.2

RELATED SECTIONS

- .1 Section 01 33 00 – Submittal Procedures.
- .2 Section 01 47 13 – LEED Requirements.
- .3 Section 01 47 17 – Sustainable Requirements: Contractor's Verification.
- .4 Section 01 74 11 – Cleaning.
- .5 Section 01 74 19 – Waste Management and Disposal.
- .6 Section 01 78 00 – Closeout Submittals.
- .7 Section 01 91 13 – General Commissioning (Cx) Requirements.
- .8 Section 23 05 00 – HVAC Design Requirements.
- .9 Section 23 05 93 – Testing, Adjusting and Balancing of HVAC.
- .10 Section 23 30 00 – HVAC Distribution.
- .11 Section 23 82 00 – Terminal and Packaged Units.

1.3

REFERENCES

- .1 American Conference of Governmental Industrial Hygienists, Inc. (ACGIH)
 - .1 Industrial Ventilation: A Manual of Recommended Practice, 24th Edition.
- .2 Air Moving and Control Association International, Inc. (AMCA)
 - .1 AMCA 210-99, Laboratory Methods of Testing Fans for Aerodynamic Performance Rating.
- .3 Air-Conditioning, Heating and Refrigeration Institute (AHRI)
 - .1 AHRI 210/240-2008, Unitary Air-Conditioning and Air-Source Heat Pump Equipment.
 - .2 AHRI 320-98, Water-Source Heat Pumps.
 - .3 AHRI 325-98, Ground Water-Source Heat Pumps.
- .4 Canadian Standards Association (CSA)
 - .1 CAN/CSA C748-94 (2005), Performance of Direct-Expansion (Dx) Ground-Source Heat Pumps.
 - .2 CAN/CSA C656-05, Performance Standard for Single Package Central Air Conditioners and Heat Pumps.
- .5 Environment Canada (EC)
 - .1 EPS 1/RA/2-96 Environmental Code of Practice for Elimination of Fluorocarbon Emissions from Refrigeration and Air Conditioning Systems.
- .6 National Electrical Manufacturers Association (NEMA)
 - .1 NEMA 250-2008, Enclosures for Electrical Equipment (1000 Volts Maximum).
- .7 National Fire Protection Association (NFPA)
 - .1 NFPA 91-1999, Standard for Exhaust Systems for Air Conveying of Vapors, Gases, Mists, and Non-combustible Particulate Solids.

1.4

DESIGN PERFORMANCE REQUIREMENTS

- .1 Size equipment for its intended service.
- .2 Design systems to meet local government environmental requirements.
- .3 Humidity devices: Provide humidifiers or dehumidifiers to maintain desired space humidity requirements. Use steam generator style to prevent Legionella production.
- .4 Dust and Fume Collectors
 - .1 Dust Collectors:
 - .1 Type: suitable for material being collected.
 - .2 Reintroduce filtered air into room from which material is drawn.

- .2 Fume Collectors:
 - .1 Select for anticipated fume materials.
 - .2 Design to Industrial Ventilation Manual of Recommended Practices. Design adsorption beds for at least six-months media life.

1.5 SUBMITTALS

- .1 Submit product data in accordance with Section 01 33 00 – Submittal Procedures.
- .2 Submit shop drawings for manufactured equipment in accordance with Section 01 33 00 – Submittal Procedures.
- .3 Submit calculations showing that equipment and systems meet design requirements.
- .4 Submit operation and maintenance data for equipment and components for incorporation into manual specified in Section 01 78 00 – Closeout Submittals.
- .5 Test Reports: Submit certified test reports from approved independent testing laboratories indicating compliance with specifications for specified performance characteristics and physical properties.
- .6 Certificates: Submit certificates signed by manufacturer certifying that materials comply with specified performance characteristics and physical properties.
- .7 Manufacturer's Field Services: Submit reports to the Contract Administrator within three days of receipt from manufacturer.

1.6 QUALITY ASSURANCE

- .1 Utilize design and Installation personnel thoroughly familiar with systems of this type.
- .2 Provide similar equipment from one manufacturer.
- .3 Health and Safety:
 - .1 Do construction occupational health and safety in accordance with Manitoba Workplace Safety and Health.
- .4 COR Certification:
 - .1 All members of the design/build team are to be COR Certified to participate in the design, construction and commissioning.

1.7 DELIVERY, STORAGE AND HANDLING

- .1 Maintain equipment conditions and cleanliness by protecting all openings and surfaces from fouling by dust, water, debris, corrosion, or vermin during delivery, storage and handling.
- .2 Materials damaged in transit or during storage or handling are to be replaced prior to installation.

Part 2 Products

2.1 HUMIDITY DEVICES

- .1 Humidifiers:
 - .1 Electric Resistive Steam Generating Type
 - .1 CSA certified, ULC listed.
 - .2 Cabinet: House components, with factory finish and electrically interlocked door.
 - .3 Steam Cylinder: Factory sealed, disposable, with factory installed electrodes to suit water condition.
 - .4 Controls:
 - .1 Solid state panel.
 - .2 Solenoid valve on water and drain lines.
 - .3 Wall and Duct humidistats.
 - .4 Airflow proving switch.
 - .5 Adjustable flush cycle timer.
 - .6 Amperage meter.
 - .7 Cylinder replacement indicator light.
 - .5 Duct Distribution Header: Condensate drain and supply hose.

2.2 DUST AND FUME COLLECTORS

- .1 Dust Collectors:
 - .1 Fans: Rated to AMCA 210.
 - .2 Type: Suitable for material being collected, capable of filtering to 5 microns.
 - .3 Provide clappers as required.
 - .4 Equip bag type units with air compressor, piping, manometer and necessary controls for automatic cleaning.
 - .5 Discharge: Rotary valve or sealed drum.
- .2 Fume Collectors:
 - .1 Select materials suitable for fumes being exhausted, to Industrial Ventilation Manual of Recommended Practices.
 - .2 Performance: Tested to ASHRAE 110.

2.3 UNDERFLOOR VOID VENTILATION

- .1 The site for this facility may produce levels of methane in the soil which can be harmful to life safety and building integrity if not treated. A system of passive under-floor ventilation will be provided to allow the escape of any accumulating methane as follows:
 - .1 A membrane with low permeability will be installed immediately below the slab to act as a barrier between the soil and the building.
 - .2 Any penetrations of the membrane shall be appropriately sealed to prevent the migration of possible gases into the building
 - .3 A network of perforated piping will be installed beneath the membrane to allow any methane to escape to the atmosphere.
 - .4 Methane detection shall be installed as per the mechanical drawings.
- .2 Design and installation shall be in conformance with the "Standards and Guidelines for the Mitigation of Methane Gas at Buildings and Utilities, and Guidelines for Construction on Landfill Sites" as issued by the City of Winnipeg in December, 2006.

2.4 FANS AND EQUIPMENT IN WET OR CORROSIVE AREAS

- .1 Ductwork, piping, valves, fans and control components for HVAC systems in wet or corrosive areas are to be constructed of aluminum, stainless steel, plastic or FRP to prevent degradation from exposure to water, chemical dust, fumes or galvanic corrosion in the following areas:
 - .1 Wash Bays
 - .2 Fertilizer, Pesticide, and Herbicide Storage
 - .3 Hazardous or Dangerous Goods Storage.
- .2 Motors provided on mechanical equipment in wet, dusty, or corrosive environments shall be totally enclosed fan-cooled motors, or explosion proof design as required.

2.5 VEHICLE EXHAUST COLLECTION

- .1 Provide a collection system of piping/ducts within Fleet Maintenance with a minimum of 2 outlets for connection of hoses to vehicle tail pipes for each bay. Separate vehicle exhaust extraction systems may be used for gasoline and diesel engine driven vehicles. Hoses may be retractable from overhead or outlets can be installed within the floor for connection of hoses. Provide a fan to overcome system resistance and convey exhaust to outdoors.

2.6 HAZARDOUS MATERIALS AND DANGEROUS GOODS STORAGE

- .1 Provide fire code compliant storage, venting and fire safety for hazardous materials and dangerous goods that will be located within indoor spaces as listed in Appendix C4.
- .2 Storage requirements shall consider accessibility, dispensing, spill containment, fire suppression, and ventilation for mitigation of odours and voc discharge into occupied spaces. Storage and provisions for use of the hazardous materials and dangerous goods within the facility shall be in accordance with the product manufacturer's WHMIS information and Material Safety Data Sheets.

2.7 WORK HOOD FOR PLASITC WELDING

- .1 Provide a 1.0m x 1.0m hood at 2.1m above the floor c/w solid back panel, interior light and translucent strip plastic curtain on remaining 3 sides down to 200 mm above the floor.
- .2 Design exhaust for capture of plastic welding fumes to outdoors in accordance with ACGIH recommendations

Part 3 Execution

3.1 INSTALLATION

- .1 Make required permit submissions to the authority having jurisdiction for systems and equipment.
- .2 Install systems to manufacturer's written recommendations.
- .3 Humidifiers
 - .1 Weld ductwork for a minimum distance of 3 m downstream of humidifiers, and slope to drain point.
 - .2 Provide a piped drain from welded ductwork low point to storm drainage rainwater leader, or where impractical, to a sanitary drain.

3.2 VERIFICATION

- .1 Operate equipment and verify that performance criteria specified in this section has been achieved.
- .2 Coordinate with commissioning activities specified under 01 91 13 – General Commissioning Requirements.

END OF SECTION

Part 1 General

1.1 RELATED DOCUMENTS

- .1 All work of this Division shall be coordinated and provided by the single Building Management System (BMS) Contractor.
- .2 The work of this Division shall be scheduled, coordinated, and interfaced with the associated work of other trades. Reference the Mechanical Division Sections for details.
- .3 The work of this Division shall be as required by the Specifications, Point Schedules and Drawings.
- .4 If the BMS Contractor believes there are conflicts or missing information in the project documents, the Contractor shall promptly request clarification and instruction from the design team.
- .5 If, in order to complete the Work of the Controls Contract, private and/or public telephone lines and connections, including ISDN lines and/or LAN/WAN support and connections, are required then these shall be provided by the owner (City of Winnipeg) to the Controls Contractor, at the owner's direct cost, in a timely manner.
- .6 The City of Winnipeg has an existing central monitoring system in place. Where DDC points are identified as centrally monitored points, the controls contractor shall provide and install required hardware and software to interface to the owner's Johnson Controls Metasys EA servers and workstations. These are located at the Central Control Offices, 510 Main Street, Winnipeg, Manitoba.

1.2 BMS DESCRIPTION

- .1 The Building Management System (BMS) shall be a complete system designed for use with the enterprise IT systems in place at the City of Winnipeg. This functionality shall extend into the equipment rooms. Devices residing on the automation network located in equipment rooms and similar shall be fully IT compatible devices that mount and communicate directly on the IT infrastructure in the facility. Contractor shall be responsible for coordination with the owner's IT staff to ensure that the FMS will perform in the owner's environment without disruption to any of the other activities taking place on that LAN.
- .2 All points of user interface shall be on standard PCs that do not require the purchase of any special software from the BMS manufacturer for use as a building operations terminal. The primary point of interface on these PCs will be a standard Web Browser.
- .3 Where necessary and as dictated elsewhere in these Specifications, the City of Winnipeg's existing ADX Server shall be used for the purpose of providing a location for extensive archiving of system configuration data, and historical data such as trend data and operator transactions.
- .4 The work of the single BMS Contractor shall be as defined individually and collectively in all Sections of this Division specification together with the associated Point Sheets and Drawings and the associated interfacing work as referenced in the related documents.
- .5 The BMS work shall consist of the provision of all labor, materials, tools, equipment, software, software licenses, software configurations and database entries, interfaces, wiring, tubing, installation, labeling, engineering, calibration, documentation, samples, submittals, testing, commissioning, training services, permits and licenses, transportation, shipping, handling, administration, supervision, management, insurance, temporary protection, cleaning, cutting and patching, warranties, services, and items, even though these may not be specifically mentioned in these Division documents which are required for the complete, fully functional and commissioned BMS.
- .6 Provide a complete, neat and workmanlike installation. Use only manufacturer employees who are skilled, experienced, trained, and familiar with the specific equipment, software, standards and configurations to be provided for this Project.
- .7 Manage and coordinate the BMS work in a timely manner in consideration of the Project schedules. Coordinate with the associated work of other trades so as to not impede or delay the work of associated trades.

- .8 The BMS as provided shall incorporate, at minimum, the following integrated features, functions and services:
 - .1 Operator information, alarm management and control functions.
 - .2 Enterprise-level information and control access.
 - .3 Information management including monitoring, transmission, archiving, retrieval, and reporting functions.
 - .4 Diagnostic monitoring and reporting of BMS functions.
 - .5 Offsite monitoring and management access.
 - .6 Energy management
 - .7 Standard applications for terminal HVAC systems.

1.3 QUALITY ASSURANCE

- .1 General
 - .1 The following companies are approved Controls Contractors:
 - .2 Johnson Controls Branch Office

1.4 SUBMITTALS

- .1 Shop Drawings, Product Data, and Samples
 - .1 The BMS contractor shall submit a list of all shop drawings.
 - .2 Submittals shall be in defined packages. Each package shall be complete and shall only reference itself and previously submitted packages.
 - .3 Equipment and systems requiring approval of local authorities must comply with such regulations and be approved. Filing shall be at the expense of the BMS Contractor where filing is necessary. Provide a copy of all related correspondence and permits to the Owner.
 - .4 Prepare an index of all submittals and shop drawings for the installation. Index shall include a shop drawing identification number, Contract Documents reference and item description.

1.5 RECORD DOCUMENTATION

- .1 Operation and Maintenance Manuals
 - .1 Three (3) copies of the Operation and Maintenance Manuals shall be provided to the Owner's Representative upon completion of the project. The entire Operation and Maintenance Manual shall be furnished on Compact Disc media, and include the following for the BMS provided:
 - .1 Table of contents.
 - .2 As-built system record drawings. Computer Aided Drawings (CAD) record drawings shall represent the as-built condition of the system and incorporate all information supplied with the approved submittal.
 - .3 Manufacturers product data sheets or catalog pages for all products including software.
 - .4 System Operator's manuals.
 - .5 Archive copy of all site-specific databases and sequences.
 - .6 BMS network diagrams.
 - .7 Interfaces to all third-party products and work by other trades.
 - .2 The Operation and Maintenance Manual CD shall be self-contained, and include all necessary software required to access the product data sheets. A logically organized table of contents shall provide dynamic links to view and print all product data sheets. Viewer software shall provide the ability to display, zoom, and search all documents.

1.6 WARRANTY

- .1 Standard Material and Labor Warranty:
 - .1 Provide a one-year labor and material warranty on the BMS.
 - .2 Any warranty work shall be performed during regular business hours.

Part 2 PART 2 – PRODUCTS

2.1 GENERAL DESCRIPTION

- .1 The Building Management System (BMS) shall use an open architecture and fully support a multi-vendor environment. To accomplish this effectively, the BMS shall support open communication protocol standards and integrate a wide variety of third-party devices and applications. The system shall be compatible with other owner provided networks.
- .2 The Building Management System shall consist of the following:
 - .1 Standalone Network Automation Engine(s)
 - .2 Field Equipment Controller(s)
 - .3 Input/Output Module(s)
 - .4 Other components required for a complete and working BMS
- .3 The system shall be modular in nature, and shall permit expansion of both capacity and functionality through the addition of sensors, actuators, controllers and operator devices, while re-using existing controls equipment.
- .4 System architectural design shall eliminate dependence upon any single device for alarm reporting and control execution. The failure of any single component or network connection shall not interrupt the execution of control strategies at other operational devices.
- .5 Acceptable Manufacturers
 - .1 Johnson Controls Metasys Extended Architecture

2.2 BMS ARCHITECTURE

- .1 Automation Network
 - .1 The automation network shall be based on a PC industry standard of Ethernet TCP/IP. Where used, LAN controller cards shall be standard “off the shelf” products available through normal PC vendor channels.
 - .2 The BMS shall network multiple user interface clients, automation engines, system controllers and application-specific controllers. Provide application and data server(s) as required for systems operation.
 - .3 The automation network shall be capable of operating at a communication speed of 100 Mbps, with full peer-to-peer network communication.
 - .4 Network Automation Engines (NAE) shall reside on the automation network.
 - .5 The automation network will be compatible with other enterprise-wide networks. Where indicated, the automation network shall be connected to the enterprise network and share resources with it by way of standard networking devices and practices.
 - .6 The Owner shall provide all private and public telephones lines, ISDN lines and Internet Service Provider services and connections as necessary for the Controls Contractor to complete the work as contracted at the Owner’s direct cost. The Controls Contractor shall identify the specific requirements in their shop drawing submittal.
- .2 Control Network
 - .1 Network Automation Engines shall provide supervisory control over the control network and shall support all three (3) of the following communication protocols:
 - .2 BACnet Standard MS/TP Bus Protocol ASHRAE SSPC-135, Clause 9.
 - .3 LonWorks enabled devices using the Free Topology Transceiver (FTT-10a).
 - .4 The Johnson Controls N2 Field Bus.
 - .5 Control networks shall provide either “Peer-to-Peer,” Master-Slave, or Supervised Token Passing communications, and shall operate at a minimum communication speed of 9600 baud.
 - .6 DDC Controllers shall reside on the control network.
 - .7 Control network communication protocol shall be BACnet Standard MS/TP Bus Protocol ASHRAE SSPC-135, or Johnson Controls N2 Field Bus.
 - .8 A BACnet Protocol Implementation Conformance Statement shall be provided for each controller device (master or slave) that will communicate on the BACnet MS/TP Bus.

- .9 Integration (if required)
 - .1 Hardwired
 - .1 Analog and digital signal values shall be passed from one system to another via hardwired connections.
 - .2 There will be one separate physical point on each system for each point to be integrated between the systems.
 - .2 Direct Protocol (Integrator Panel)
 - .1 The BMS system shall include appropriate hardware equipment and software to allow bi-directional data communications between the BMS system and 3rd party manufacturers' control panels. The BMS shall receive, react to, and return information from multiple building systems, including but not limited to the chillers, boilers, variable frequency drives, power monitoring system, and medical gas.
 - .2 All data required by the application shall be mapped into the Automation Engine's database, and shall be transparent to the operator.
 - .3 Point inputs and outputs from the third-party controllers shall have real-time interoperability with BMS software features such as: Control Software, Energy Management, Custom Process Programming, Alarm Management, Historical Data and Trend Analysis, Totalization, and Local Area Network Communications.
 - .3 BACnet Protocol Integration - BACnet
 - .1 The neutral protocol used between systems will be BACnet over Ethernet and comply with the ASHRAE BACnet standard 135-2003.
 - .2 A complete Protocol Implementation Conformance Statement (PICS) shall be provided for all BACnet system devices.
 - .3 The ability to command, share point object data, change of state (COS) data and schedules between the host and BACnet systems shall be provided.

2.3 USER INTERFACE

- .1 Dedicated Web Based User Interface
 - .1 Where indicated on plans the BMS Contractor shall provide and install a personal computer for command entry, information management, network alarm management, and database management functions. All real-time control functions, including scheduling, history collection and alarming, shall be resident in the BMS Network Automation Engines to facilitate greater fault tolerance and reliability.
 - .2 Dedicated User Interface Architecture – The architecture of the computer shall be implemented to conform to industry standards, so that it can accommodate applications provided by the BMS Contractor and by other third party applications suppliers, including but not limited to Microsoft Office Applications. Specifically it must be implemented to conform to the following interface standards.
 - .1 Microsoft Internet Explorer for user interface functions
 - .2 Microsoft Office Professional for creation, modification and maintenance of reports, sequences other necessary building management functions
 - .3 Microsoft Outlook or other e-mail program for supplemental alarm functionality and communication of system events, and reports
 - .4 Required network operating system for exchange of data and network functions such as printing of reports, trends and specific system summaries.
 - .3 PC Hardware – The personal computer(s) shall be configured as follows:
 - .1 Memory – 1 GB (512 MB Minimum)
 - .2 CPU– Pentium 4 processor. 2.8 Hz Clock Speed (2.0 GHz minimum)
 - .3 Hard Drive – 80 GB free hard drive space (40GB minimum)

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- .4 Hard drive backup system – CD/RW, DVD/RW or network backup software provided by IT department
- .5 CD ROM Drive – 32X performance
- .6 Ports – (2) Serial and (1) parallel, (2) USB ports
- .7 Keyboard – 101 Keyboard and 2 Button Mouse
- .8 CRT configuration – 1-2 CRTs as follows:
- .9 Each Display – 17" Flat Panel Monitor 1280 x 1024 resolution minimum.
- .10 16 bit or higher color resolution
- .11 Display card with multiple monitor support
- .12 LAN communications – Ethernet communications board; 3Comm or equal.
- .4 Operating System Software
 - .1 Windows 2000 Professional or Windows XP Professional
 - .2 Where user interface is not provided via browser, provide complete operator workstation software package, including any hardware or software keys. Include the original installation disks and licenses for all included software, device drivers, and peripherals.
 - .3 Provide software registration cards to the Owner for all included software.
- .5 Peripheral Hardware
 - .1 Reports printer:
 - .1 Printer Make – Hewlett Packard DeskJet
 - .2 Print Speed – 600 DPI Black, 300 DPI Color
 - .3 Buffer – 64 K Input Print Buffer
 - .4 Color Printing – Include Color Kit
- .2 Distributed Web Based User Interface
 - .1 All features and functions of the dedicated user interface previously defined in this document shall be available on any computer connected directly or via a wide area or virtual private network (WAN/VPN) to the automation network and conforming to the following specifications.
 - .2 The software shall run on the Microsoft Internet Explorer (6.0 or higher) browser.
 - .3 Minimum hardware requirements:
 - .1 256 MB RAM
 - .2 2.0 GHz Clock Speed Pentium 4 Microprocessor.
 - .3 40.0 GB Hard Drive.
 - .4 1 Keyboard with 83 keys (minimum).
 - .5 SVGA 1024x768 resolution display with 64K colors and 16 bit color depth.
 - .6 Mouse or other pointing device
- .3 User Interface Application Components
 - .1 Operator Interface
 - .1 An integrated browser based client application shall be used as the user operator interface program.
 - .2 All Inputs, Outputs, Setpoints, and all other parameters as defined within Part 3, shown on the design drawings, or required as part of the system software, shall be displayed for operator viewing and modification from the operator interface software.
 - .3 The user interface software shall provide help menus and instructions for each operation and/or application.
 - .4 All controller software operating parameters shall be displayed for the operator to view/modify from the user interface. These include: setpoints, alarm limits, time delays, PID tuning constants, run-times, point statistics, schedules, and so forth.
 - .5 The Operator Interface shall incorporate comprehensive support for functions including, but not necessarily limited to, the following:
 - .1 User access for selective information retrieval and control command execution
 - .2 Monitoring and reporting
 - .3 Alarm, non-normal, and return to normal condition annunciation

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- .4 Selective operator override and other control actions
- .5 Information archiving, manipulation, formatting, display and reporting
- .6 FMS internal performance supervision and diagnostics
- .7 On-line access to user HELP menus
- .8 On-line access to current FMS as-built records and documentation
- .9 Means for the controlled re-programming, re-configuration of FMS operation and for the manipulation of FMS database information in compliance with the prevailing codes, approvals and regulations for individual FMS applications.
- .6 The operation of the control system shall be independent of the user interface, which shall be used for operator communications only. Systems that rely on an operator workstation to provide supervisory control over controller execution of the sequences of operations or system communications shall not be acceptable.
- .2 Navigation Trees
 - .1 The system will have the capability to display multiple navigation trees that will aid the operator in navigating throughout all systems and points connected. At minimum provide a tree that identifies all systems on the networks.
 - .2 Provide the ability for the operator to add custom trees. The operator will be able to define any logical grouping of systems or points and arrange them on the tree in any order. It shall be possible to nest groups within other groups. Provide at minimum 5 levels of nesting.
 - .3 The navigation trees shall be "dockable" to other displays in the user interface such as graphics. This means that the trees will appear as part of the display, but can be detached and then minimized to the Windows task bar or closed altogether. A simple keystroke will reattach the navigation to the primary display of the user interface.
- .3 Alarms
 - .1 Alarms shall be routed directly from Network Automation Engines to PCs and servers. It shall be possible for specific alarms from specific points to be routed to specific PCs and servers. The alarm management portion of the user interface shall, at the minimum, provide the following functions:
 - .1 Log date and time of alarm occurrence.
 - .2 Generate a "Pop-Up" window, with audible alarm, informing a user that an alarm has been received.
 - .3 Allow a user, with the appropriate security level, to acknowledge, temporarily silence, or discard an alarm.
 - .4 Provide an audit trail on hard drive for alarms by recording user acknowledgment, deletion, or disabling of an alarm. The audit trail shall include the name of the user, the alarm, the action taken on the alarm, and a time/date stamp.
 - .5 Provide the ability to direct alarms to an e-mail address or alphanumeric pager. This must be provided in addition to the pop up window described above. Systems that use e-mail and pagers as the exclusive means of annunciating alarms are not acceptable.
 - .6 Any attribute of any object in the system may be designated to report an alarm.
 - .2 The FMS shall annunciate diagnostic alarms indicating system failures and non-normal operating conditions
 - .3 The FMS shall annunciate application alarms at minimum, as required by Part 3.
- .4 Reports and Summaries

- .1 Reports and Summaries shall be generated and directed to the user interface displays, with subsequent assignment to printers, or disk. As a minimum, the system shall provide the following reports:
 - .1 All points in the BMS
 - .2 All points in each BMS application
 - .3 All points in a specific controller
 - .4 All points in a user-defined group of points
 - .5 All points currently in alarm
 - .6 All points locked out
 - .7 All BMS schedules
 - .8 All user defined and adjustable variables, schedules, interlocks and the like.
 - .1 Summaries and Reports shall be accessible via standard UI functions and not dependent upon custom programming or user defined HTML pages.
 - .2 Selection of a single menu item, tool bar item, or tool bar button shall print any displayed report or summary on the system printer for use as a building management and diagnostics tool.
 - .3 The system shall allow for the creation of custom reports and queries via a standard web services XML interface and commercial off-the-shelf software such as Microsoft Access, Microsoft Excel, or Crystal Reports.
- .5 Schedules
 - .1 A graphical display for time-of-day scheduling and override scheduling of building operations shall be provided. At a minimum, the following functions shall be provided:
 - .1 Weekly schedules
 - .2 Exception Schedules
 - .3 Monthly calendars.
 - .1 Weekly schedules shall be provided for each group of equipment with a specific time use schedule.
 - .2 It shall be possible to define one or more exception schedules for each schedule including references to calendars
 - .3 Monthly calendars shall be provided that allow for simplified scheduling of holidays and special days for a minimum of five years in advance. Holidays and special days shall be user-selected with the pointing device or keyboard, and shall automatically reschedule equipment operation as previously defined on the exception schedules.
 - .4 Changes to schedules made from the User Interface shall directly modify the Network Automation Engine schedule database.
 - .5 Schedules and Calendars shall comply with ASHRAE SP135/2003 BACnet Standard.
 - .6 Selection of a single menu item or tool bar button shall print any displayed schedule on the system printer for use as a building management and diagnostics tool.
- .6 Password
 - .1 Multiple-level password access protection shall be provided to allow the user/manager to user interface control, display, and database manipulation capabilities deemed appropriate for each user, based on an assigned password.
 - .2 Each user shall have the following: a user name (24 characters minimum), a password (12 characters minimum), and access levels.
 - .3 The system shall allow each user to change his or her password at will.

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- .4 When entering or editing passwords, the system shall not echo the actual characters for display on the monitor.
- .5 A minimum of five levels of access shall be supported individually or in any combination as follows:
 - .1 Level 1 = View Data
 - .2 Level 2 = Command
 - .3 Level 3 = Operator Overrides
 - .4 Level 4 = Database Modification
 - .5 Level 5 = Database Configuration
 - .6 Level 6 = All privileges, including Password Add/Modify
- .6 A minimum of 100 unique passwords shall be supported.
- .7 Operators shall be able to perform only those commands available for their respective passwords. Display of menu selections shall be limited to only those items defined for the access level of the password used to log-on.
- .8 The system shall automatically generate a report of log-on/log-off and system activity for each user. Any action that results in a change in the operation or configuration of the control system shall be recorded, including: modification of point values, schedules or history collection parameters, and all changes to the alarm management system, including the acknowledgment and deletion of alarms.
- .7 Screen Manager - The User Interface shall be provided with screen management capabilities that allow the user to activate, close, and simultaneously manipulate a minimum of 4 active display windows plus a network or user defined navigation tree.
- .8 Dynamic Color Graphics
 - .1 The graphics application program shall be supplied as an integral part of the User Interface. Browser or Workstation applications that rely only upon HTML pages shall not be acceptable.
 - .2 The graphics applications shall include a create/edit function and a runtime function. The system architecture shall support an unlimited number of graphics documents (graphic definition files) to be generated and executed. The graphics shall be able to display and provide animation based on real-time data that is acquired, derived, or entered.
 - .3 Graphics runtime functions – A maximum of 16 graphic applications shall be able to execute at any one time on a user interface or workstation with 4 visible to the user. Each graphic application shall be capable of the following functions:
 - .1 All graphics shall be fully scalable
 - .2 The graphics shall support a maintained aspect ratio.
 - .3 Multiple fonts shall be supported.
 - .4 Unique background shall be assignable on a per graphic basis.
 - .5 The color of all animations and values on displays shall indicate if the status of the object attribute.
 - .4 Operation from graphics – It shall be possible to change values (setpoints) and states in system controlled equipment by using drop-down windows accessible via the pointing device
 - .5 Graphic editing tool – A graphic editing tool shall be provided that allows for the creation and editing of graphic files. The graphic editor shall be capable of performing/defining all animations, and defining all runtime binding.
 - .1 The graphic editing tool shall in general provide for the creation and positioning of point objects by dragging from tool bars or drop-downs and positioning where required.
 - .2 In addition, the graphic editing tool shall be able to add additional content to any graphic by importing backgrounds in the SVG, BMP or JPG file formats.

- .6 Aliasing – Many graphic displays representing part of a building and various building components are exact duplicates, with the exception that the various variables are bound to different field values. Consequently, it shall be possible to bind the value of a graphic display to aliases, as opposed to the physical field tags.
- .9 Historical trending and data collection
 - .1 Each Automation Engine shall store trend and point history data for all analog and digital inputs and outputs, as follows:
 - .1 Any point, physical or calculated, may be designated for trending. Three methods of collection shall be allowed:
 - .1 Defined time interval
 - .2 Upon a change of value
 - .2 Each Automation Engine shall have the capability to store multiple samples for each physical point and software variable based upon available memory, including an individual sample time/date stamp. Points may be assigned to multiple history trends with different collection parameters.
- .10 Trend data viewing and analysis
 - .1 Provide a trend viewing utility that shall have access to all database points.
 - .2 It shall be possible to retrieve any historical database point for use in displays and reports by specifying the point name and associated trend name.
 - .3 The trend viewing utility shall have the capability to define trend study displays to include multiple trends
 - .4 Displays shall be able to be single or stacked graphs with on-line selectable display characteristics, such as ranging, color, and plot style.
 - .5 Display magnitude and units shall both be selectable by the operator at any time without reconfiguring the processing or collection of data. This is a zoom capability.
 - .6 Display magnitude shall automatically be scaled to show full graphic resolution of the data being displayed.
 - .7 Trend studies shall be capable of calculating and displaying calculated variables including highest value, lowest value and time based accumulation.

2.4 NETWORK AUTOMATION ENGINES (NAE)

- .1 Network Automation Engine (NAE)
 - .1 The Network Automation Engine (NAE) shall be a fully user-programmable, supervisory controller. The NAE shall monitor the network of distributed application-specific controllers, provide global strategy and direction, and communicate on a peer-to-peer basis with other Network Automation Engines.
 - .2 Automation network – The NAE shall reside on the automation network and shall support a subnet of system controllers.
 - .3 User Interface – Each NAE shall have the ability to deliver a web based User Interface (UI) as previously described. All computers connected physically or virtually to the automation network shall have access to the web based UI.
 - .1 The web based UI software shall be imbedded in the NAE. Systems that require a local copy of the system database on the user's personal computer are not acceptable.
 - .2 The NAE shall support up four (4) concurrent users.
 - .3 The web based user shall have the capability to access all system data through one NAE.
 - .4 Remote users connected to the network through an Internet Service Provider (ISP) or telephone dial up shall also have total system access through one NAE.

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- .5 Systems that require the user to address more than one NAE to access all system information are not acceptable.
- .6 The NAE shall have the capability of generating web based UI graphics. The graphics capability shall be imbedded in the NAE.
- .7 Systems that support UI Graphics from a central database or require the graphics to reside on the user's personal computer are not acceptable.
- .8 The web based UI shall support the following functions using a standard version of Microsoft Internet Explorer:
 - .1 Configuration
 - .2 Commissioning
 - .3 Data Archiving
 - .4 Monitoring
 - .5 Commanding
 - .6 System Diagnostics
- .9 Systems that require workstation software or modified web browsers are not acceptable.
- .10 The NAE shall allow temporary use of portable devices without interrupting the normal operation of permanently connected modems.
- .4 Processor – The NAE shall be microprocessor-based with a minimum word size of 32 bits. The NAE shall be a multi-tasking, multi-user, and real-time digital control processor. Standard operating systems shall be employed. NAE size and capability shall be sufficient to fully meet the requirements of this Specification.
- .5 Memory – Each NAE shall have sufficient memory to support its own operating system, databases, and control programs, and to provide supervisory control for all control level devices.
- .6 Hardware Real Time Clock – The NAE shall include an integrated, hardware-based, real-time clock.
- .7 The NAE shall include troubleshooting LED indicators to identify the following conditions:
 - .1 Power - On/Off
 - .2 Ethernet Traffic – Ethernet Traffic/No Ethernet Traffic
 - .3 Ethernet Connection Speed – 10 Mbps/100 Mbps
 - .4 FC Bus – Normal Communications/No Field Communications
 - .5 Peer Communication – Data Traffic between NAE Devices
 - .6 Run – NAE Running/NAE in Start-up/NAE Shutting Down/Software Not Running
 - .7 Bat Fault – Battery Defective, Data Protection Battery Not Installed
 - .8 Fault – General Fault
 - .9 Modem RX – NAE Modem Receiving Data
 - .10 Modem TX – NAE Modem Transmitting Data
- .8 Communications Ports – The NAE shall provide the following ports for operation of operator Input/Output (I/O) devices, such as industry-standard computers, modems, and portable operator's terminals.
 - .1 Up to two (2) USB port
 - .2 Up to two (2) URS-232 serial data communication port
 - .3 Up to two (2) RS-485 port
 - .4 One (1) Ethernet port
- .9 Diagnostics – The NAE shall continuously perform self-diagnostics, communication diagnosis, and diagnosis of all panel components. The Network Automation Engine shall provide both local and remote annunciation of any detected component failures, low battery conditions, or repeated failures to establish communication.
- .10 Power Failure – In the event of the loss of normal power, The NAE shall continue to operate for a user adjustable period of up to 10 minutes after which there shall be an orderly shutdown of all programs to prevent the loss of database or operating system software.

- .1 During a loss of normal power, the control sequences shall go to the normal system shutdown conditions. All critical configuration data shall be saved into Flash memory.
- .2 Upon restoration of normal power and after a minimum off-time delay, the controller shall automatically resume full operation without manual intervention through a normal soft-start sequence.
- .11 Certification – The NAE shall be listed by Underwriters Laboratories (UL).
- .12 Controller network – The NAE shall support the following communication protocols on the controller network:
 - .1 The NAE shall support BACnet Standard MS/TP Bus Protocol ASHRAE SSPC-135, Clause 9 on the controller network.
 - .1 A BACnet Protocol Implementation Conformance Statement shall be provided for each controller device (master or slave) that will communicate on the BACnet MS/TP Bus.
 - .2 The Conformance Statements shall be submitted 10 day prior to bidding.
 - .3 The NAE shall support a minimum of 100 control devices.
 - .2 The NAE shall support LonWorks enabled devices using the Free Topology Transceiver FTT10.
 - .1 All LonWorks controls devices shall be LonMark certified.
 - .2 The NAE shall support a minimum of 255 LonWorks enabled control devices.
 - .3 The NAE shall support the Johnson Controls N2 Field Bus.
 - .1 The NAE shall support a minimum of 100 N2 control devices.
 - .2 The Bus shall conform to Electronic Industry Alliance (EIA) Standard RS-485.
 - .3 The Bus shall employ a master/slave protocol where the NAE is the master.
 - .4 The Bus shall employ a four (4) level priority system for polling frequency.
 - .5 The Bus shall be optically isolated from the NAE.
 - .6 The Bus shall support the Metasys Integrator System.

2.5 BACNET DDC SYSTEM CONTROLLERS

- .1 Field Equipment Controller (**FEC**)
 - .1 The Field Equipment Controller (FEC) shall be a fully user-programmable, digital controller that communicates via BACnet MS/TP protocol.
 - .2 The FEC shall employ a finite state control engine to eliminate unnecessary conflicts between control functions at crossover points in their operational sequences. Suppliers using non-state based DDC shall provide separate control strategy diagrams for all controlled functions in their submittals.
 - .3 Controllers shall be factory programmed with a continuous adaptive tuning algorithm that senses changes in the physical environment and continually adjusts loop tuning parameters appropriately. Controllers that require manual tuning of loops or perform automatic tuning on command only shall not be acceptable.
 - .4 The FEC shall be assembled in a plenum-rated plastic housing with flammability rated to UL94-5VB.
 - .5 The FEC shall include a removable base to allow pre-wiring without the controller.
 - .6 The FEC shall include troubleshooting LED indicators to identify the following conditions:
 - .1 Power On
 - .2 Power Off
 - .3 Download or Start-up in progress, not ready for normal operation
 - .4 No Faults
 - .5 Device Fault
 - .6 Field Controller Bus - Normal Data Transmission

- .7 Field Controller Bus - No Data Transmission
- .8 Field Controller Bus - No Communication
- .9 Sensor-Actuator Bus - Normal Data Transmission
- .10 Sensor-Actuator Bus - No Data Transmission
- .11 Sensor-Actuator Bus - No Communication
- .7 The FEC shall accommodate the direct wiring of analog and binary I/O field points.
- .8 The FEC shall support the following types of inputs and outputs:
 - .1 Universal Inputs - shall be configured to monitor any of the following:
 - .1 Analog Input, Voltage Mode
 - .2 Analog Input, Current Mode
 - .3 Analog Input, Resistive Mode
 - .4 Binary Input, Dry Contact Maintained Mode
 - .5 Binary Input, Pulse Counter Mode
 - .2 Binary Inputs - shall be configured to monitor either of the following:
 - .1 Dry Contact Maintained Mode
 - .2 Pulse Counter Mode
 - .3 Analog Outputs - shall be configured to output either of the following
 - .1 Analog Output, Voltage Mode
 - .2 Analog Output, current Mode
 - .4 Binary Outputs - shall output the following:
 - .1 24 VAC Triac
 - .5 Configurable Outputs - shall be capable of the following:
 - .1 Analog Output, Voltage Mode
 - .2 Binary Output Mode
- .9 The FEC shall have the ability to reside on a Field Controller Bus (FC Bus).
 - .1 The FC Bus shall be a Master-Slave/Token-Passing (MS/TP) Bus supporting BACnet Standard protocol SSPC-135, Clause 9.
 - .2 The FC Bus shall support communications between the FECs and the NAE.
 - .3 The FC Bus shall also support Input/Output Module (IOM) communications with the FEC and with the NAE.
 - .4 The FC Bus shall support a minimum of 100 IOMs and FEC in any combination.
 - .5 The FC Bus shall operate at a maximum distance of 15,000 Ft. between the FEC and the furthest connected device.
- .10 The FEC shall have the ability to monitor and control a network of sensors and actuators over a Sensor-Actuator Bus (SA Bus).
 - .1 The SA Bus shall be a Master-Slave/Token-Passing (MS/TP) Bus supporting BACnet Standard protocol SSPC-135, Clause 9.
 - .2 The SA Bus shall support a minimum of 10 devices per trunk.
 - .3 The SA Bus shall operate at a maximum distance of 1,200 Ft. between the FEC and the furthest connected device.
- .11 The FEC shall have the capability to execute complex control sequences involving direct wired I/O points as well as input and output devices communicating over the FC Bus or the SA Bus.
- .12 The FEC shall support, but not be limited to, the following:
 - .1 Hot water, chilled water/central plant applications
 - .2 Built-up air handling units for special applications
 - .3 Terminal units
 - .4 Special programs as required for systems control

2.6**FIELD DEVICES**

- .1 Input/Output Module (**IOM**)
 - .1 The Input/Output Module (IOM) provides additional inputs and outputs for use in the FEC.
 - .2 The IOM shall communicate with the FEC over the FC Bus or the SA Bus using BACnet Standard protocol SSPC-135, Clause 9.

- .3 The IOM shall be assembled in a plenum-rated plastic housing with flammability rated to UL94-5VB.
- .4 The IOM shall have a minimum of 4 points to a maximum of 17 points.
- .5 The IOM shall support the following types of inputs and outputs:
 - .1 Universal Inputs - shall be configured to monitor any of the following:
 - .1 Analog Input, Voltage Mode
 - .2 Analog Input, Current Mode
 - .3 Analog Input, Resistive Mode
 - .4 Binary Input, Dry Contact Maintained Mode
 - .5 Binary Input, Pulse Counter Mode
 - .2 Binary Inputs - shall be configured to monitor either of the following:
 - .1 Dry Contact Maintained Mode
 - .2 Pulse Counter Mode
 - .3 Analog Outputs - shall be configured to output either of the following:
 - .1 Analog Output, Voltage Mode
 - .2 Analog Output, current Mode
 - .4 Binary Outputs - shall output the following:
 - .1 24 VAC Triac
 - .5 Configurable Outputs - shall be capable of the following:
 - .1 Analog Output, Voltage Mode
 - .2 Binary Output Mode
 - .6 The IOM shall include troubleshooting LED indicators to identify the following conditions:
 - .1 Power On
 - .2 Power Off
 - .3 Download or Start-up in progress, not ready for normal operation
 - .4 No Faults
 - .5 Device Fault
 - .6 Normal Data Transmission
 - .7 No Data Transmission
 - .8 No Communication
- .2 **Networked Thermostat (TEC)**
 - .1 The Networked Thermostats shall be capable of controlling the following:
 - .1 A four pipe fan coil system with multi-speed fan control.
 - .2 A pressure dependant Variable Air Volume System or similar zoning type system using reheat.
 - .3 A two pipe fan coil with a single speed fan.
 - .2 The Networked Thermostat shall communicate over the Field Controller Bus using BACnet Standard protocol SSPC-135, Clause 9.
 - .1 The Networked Thermostat shall support remote read/write and parameter adjustment from the web based User Interfaceable through a Network Automation Engine.
 - .3 The Networked Thermostat shall include an intuitive User Interface providing plain text messages.
 - .1 Two line, 8 character backlit display
 - .2 LED indicators for Fan, Heat, and Cool status
 - .3 Five (5) User Interface Keys
 - .1 Mode
 - .2 Fan
 - .3 Override
 - .4 Degrees C/F
 - .5 Up/Down
 - .4 The display shall continuously scroll through the following parameters:
 - .1 Room Temperature
 - .2 System Mode
 - .3 Schedule Status – Occupied/Unoccupied/Override
 - .4 Applicable Alarms

- .4 The Networked Thermostats shall provide the flexibility to support the following inputs:
 - .1 Integral Indoor Air Temperature Sensor
 - .2 Duct Mount Air Temperature Sensor
 - .3 Remote Indoor Air Temperature Sensor with Occupancy Override and LED Indicator.
 - .4 Two configurable binary inputs
- .5 The Networked Thermostats shall provide the flexibility to support the following outputs:
 - .1 Three Speed Fan Control
 - .2 On/Off Control
 - .3 Floating Control
 - .4 Proportional (0 to 10V) Control
- .6 The Networked Thermostat shall provide a minimum of six (6) levels of keypad lockout.
- .7 The Networked Thermostat shall provide the flexibility to adjust the following parameters:
 - .1 Adjustable Temporary Occupancy from 0 to 24 hours
 - .2 Adjustable heating/cooling deadband from 2° F to 5° F
 - .3 Adjustable heating/cooling cycles per hour from 4 to 8
- .8 The Networked Thermostat shall employ non-volatile electrically erasable programmable read-only memory (EEPROM) for all adjustable parameters.
- .3 VAV Modular Assembly (VMA)
 - .1 The VAV Modular Assembly shall provide both standalone and networked direct digital control of pressure-independent, variable air volume terminal units. It shall address both single and dual duct applications.
 - .2 The VAV Modular Assembly shall communicate over the FC Bus using BACnet Standard protocol SSPC-135, Clause 9.
 - .3 The VAV Modular Assembly shall have internal electrical isolation for AC power, DC inputs, and MS/TP communications. An externally mounted isolation transformer shall not be acceptable.
 - .4 The VAV Modular Assembly shall be a configurable digital controller with integral differential pressure transducer and damper actuator. All components shall be connected and mounted as a single assembly that can be removed as one piece.
 - .5 The VAV Modular Assembly shall be assembled in a plenum-rated plastic housing with flammability rated to UL94-5VB.
 - .6 The integral damper actuator shall be a fast response stepper motor capable of stroking 90 degrees in 30 seconds for quick damper positioning to speed commissioning and troubleshooting tasks.
 - .7 The controller shall determine airflow by dynamic pressure measurement using an integral dead-ended differential pressure transducer. The transducer shall be maintenance-free and shall not require air filters.
 - .8 Each controller shall have the ability to automatically calibrate the flow sensor to eliminate pressure transducer offset error due to ambient temperature / humidity effects.
 - .9 The controller shall utilize a proportional plus integration (PI) algorithm for the space temperature control loops.
 - .10 Each controller shall continuously, adaptively tune the control algorithms to improve control and controller reliability through reduced actuator duty cycle. In addition, this tuning reduces commissioning costs, and eliminates the maintenance costs of manually re-tuning loops to compensate for seasonal or other load changes.
 - .11 The controller shall provide the ability to download and upload VMA configuration files, both locally and via the communications network. Controllers shall be able to be loaded individually or as a group using a zone schedule generated spreadsheet of controller parameters.

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- .12 Control setpoint changes initiated over the network shall be written to VMA non-volatile memory to prevent loss of setpoint changes and to provide consistent operation in the event of communication failure.
- .13 The controller firmware shall be flash-upgradeable remotely via the communications bus to minimize costs of feature enhancements.
- .14 The controller shall provide fail-soft operation if the airflow signal becomes unreliable, by automatically reverting to a pressure-dependent control mode.
- .15 The controller shall interface with balancer tools that allow automatic recalculation of box flow pickup gain ("K" factor), and the ability to directly command the airflow control loop to the box minimum and maximum airflow setpoints.
- .16 Controller performance shall be self-documenting via on-board diagnostics. These diagnostics shall consist of control loop performance measurements executing at each control loop's sample interval, which may be used to continuously monitor and document system performance. The VMA shall calculate exponentially weighted moving averages (EWMA) for each of the following. These metrics shall be available to the end user for efficient management of the VAV terminals.
 - .1 Absolute temperature loop error.
 - .2 Signed temperature loop error.
 - .3 Absolute airflow loop error.
 - .4 Signed airflow loop error.
 - .5 Average damper actuator duty cycle.
- .17 The controller shall detect system error conditions to assist in managing the VAV zones. The error conditions shall consist of:
 - .1 Unreliable space temperature sensor.
 - .2 Unreliable differential pressure sensor.
 - .3 Starved box.
 - .4 Actuator stall
 - .5 Insufficient cooling.
 - .6 Insufficient heating.The controller shall provide a flow test function to view damper position vs. flow in a graphical format. The information would alert the user to check damper position. The VMA would also provide a method to calculate actuator duty cycle as an indicator of damper actuator runtime.
- .18 The controller shall provide a compliant interface for ASHRAE Standard 62-1989 (indoor air quality), and shall be capable of resetting the box minimum airflow Based on the percent of outdoor air in the primary air stream.
- .19 The controller shall comply with ASHRAE Standard 90.1 (energy efficiency) by preventing simultaneous heating and cooling, and where the control strategy requires reset of airflow while in reheat, by modulating the box reheat device fully open prior to increasing the airflow in the heating sequence.
- .20 Inputs:
 - .1 Analog inputs with user defined ranges shall monitor the following analog signals, without the addition of equipment outside the terminal controller cabinet:
 - .1 0-10 VDC Sensors
 - .2 1000ohm RTDs
 - .3 NTC Thermistors
 - .2 Binary inputs shall monitor dry contact closures. Input shall provide filtering to eliminate false signals resulting from input "bouncing."
 - .3 For noise immunity, the inputs shall be internally isolated from power, communications, and output circuits.
 - .4 Provide side loop application for humidity control.
- .21 Outputs
 - .1 Analog outputs shall provide the following control outputs:
 - .1 0-10 VDC
 - .2 Binary outputs shall provide a SPST Triac output rated for 500mA at 24 VAC.

- .3 For noise immunity, the outputs shall be internally isolated from power, communications, and other output circuits.
- .22 Application Configuration
 - .1 The VAV Modular Assembly shall be configured with a software tool that provides a simple Question/Answer format for developing applications and downloading.
- .23 Sensor Support
 - .1 The VAV Modular Assembly shall communicate over the Sensor-Actuator Bus (SA Bus) with a Network Sensor.
 - .2 The VMA shall support an LCD display room sensor.
 - .3 The VMA shall also support standard room sensors as defined by analog input requirements.
 - .4 The VMA shall support humidity sensors defined by the AI side loop.
- .4 Network Sensors (NS)
 - .1 The Network Sensors (NS) shall have the ability to monitor the following variables as required by the systems sequence of operations:
 - .1 Zone Temperature
 - .2 Zone humidity
 - .3 Zone setpoint
 - .2 The NS shall transmit the zone information back to the controller on the Sensor-Actuator Bus (SA Bus) using BACnet Standard protocol SSPC-135, Clause 9.
 - .3 The Network Sensors shall include the following items:
 - .1 A backlit Liquid Crystal Display (LCD) to indicate the Temperature, Humidity and Setpoint.
 - .2 An LED to indicate the status of the Override feature.
 - .3 A button to toggle the temperature display between Fahrenheit and Celsius.
 - .4 A button to initiate a timed override command
 - .4 The NS shall be available with either screw terminals or phone jack.
 - .5 The NS shall be available in either surface mount or wall mount styles.
- .5 Many-To-One Wireless Room Temperature Sensor System (**WRS**)
 - .1 The Many-To-One System Receiver (WRS Receiver) shall receive wireless Radio Frequency (RF) signals containing temperature data from multiple Wireless Room Temperature Sensors (WRS Sensors).
 - .1 The WRS Receiver shall use direct sequence spread spectrum RF technology.
 - .2 The WRS Receiver shall operate on the 2.4 GHZ ISM Band.
 - .3 The WRS Receiver shall meet the IEEE 802.15.4 standard for low-power, low duty-cycle RF transmitting systems.
 - .4 The WRS Receiver shall be FCC compliant to CFR Part 15 subpart B Class A.
 - .5 The WRS Receiver shall operate as a bidirectional transceiver with the sensors to confirm and synchronize data transmission.
 - .6 The WRS Receiver shall be capable of communication with WRS Sensors up to a distance of 200 Feet.
 - .7 The WRS Receiver shall be assembled in a plenum rated plastic housing with flammability rated to UL94-5VB.
 - .8 The WRS Receiver shall have LED indicators to provide information regarding the following conditions:
 - .1 Power On/Off
 - .2 Ethernet – Receiver Activity/No Activity
 - .3 Wireless Normal Mode – Transmission from sensors/No Transmission
 - .4 Wireless Rapid Transmit Mode – No transmission/ weak signal/Adequate signal/Excellent signal
 - .5 Ethernet Connection – No connection/10Mbps connection/100Mbps connection

- .6 Network Activity – No Network Activity/Half-Duplex Communication/Full-Duplex Communication
- .2 The WRS Sensors shall sense and report room temperatures to the WRS Receiver.
 - .1 The WRS Sensors shall use direct sequence spread spectrum RF technology.
 - .2 The WRS Sensors shall operate on the 2.4 GHZ ISM Band.
 - .3 The WRS Sensors shall meet the IEEE 802.15.4 standard for low-power, low duty-cycle RF transmitting systems.
 - .4 The WRS sensors shall be FCC compliant to CFR Part 15 subpart B Class A.
 - .5 The WRS sensors shall be available with
 - .1 Warmer/Cooler Set Point Adjustment
 - .2 No Set Point Adjustment
 - .3 Set Point Adjustment Scale – 55 to 85° F.
 - .6 The WRS sensors shall be assembled in NEMA 1 plastic housings.

2.7

SYSTEM TOOLS

- .1 System Configuration Tool (SCT)
 - .1 The Configuration Tool shall be a software package enabling a computer platform to be used as a stand-alone engineering configuration tool for a Network Automation Engine (NAE) or a Network Integration Engine (NIE).
 - .2 The configuration tool shall provide an archive database for the configuration and application data.
 - .3 The configuration tool shall have the same look-and-feel at the User Interface (UI) regardless of whether the configuration is being done online or offline.
 - .4 The configuration tool shall include the following features:
 - .1 Basic system navigation tree for connected networks
 - .2 Integration of Metasys N1, LonWorks, and BACnet enabled devices
 - .3 Customized user navigation trees
 - .4 Point naming operating parameter setting
 - .5 Graphic diagram configuration
 - .6 Alarm and event message routing
 - .7 Graphical logic connector tool for custom programming
 - .8 Downloading, uploading, and archiving databases
 - .5 The configuration tool shall have the capability to automatically discover field devices on connected buses and networks. Automatic discovery shall be available for the following field devices:
 - .1 BACnet Devices
 - .2 LonWorks devices
 - .3 N2 Bus devices
 - .4 Metasys N1 networks
 - .6 The configuration tool shall be capable of programming the Field Equipment Controllers.
 - .1 The configuration tool shall provide the capability to configure, simulate, and commission the Field Equipment Controllers.
 - .2 The configuration tool shall allow the FECs to be run in Simulation Mode to verify the applications.
 - .3 The configuration tool shall contain a library of standard applications to be used for configuration.
 - .7 The configuration tool shall be capable of programming the field devices.
 - .1 The configuration tool shall provide the capability to configure, simulate, and commission the field devices.
 - .2 The configuration tool shall allow the field devices to be run in Simulation Mode to verify the applications.
 - .3 The configuration tool shall contain a library of standard applications to be used for configuration

- .8 A wireless access point shall allow a wireless enabled portable PC to make a temporary Ethernet connection to the automation network.
 - .1 The wireless connection shall allow the PC to access configuration tool through the web browser using the User Interface (UI).
 - .2 The wireless use of configuration tool shall be the same as a wired connection in every respect.
 - .3 The wireless connection shall use the Bluetooth Wireless Technology.
- .2 Wireless MS/TP Converter (BTCVT)
 - .1 The converter shall provide a temporary wireless connection between the SA or FC Bus and a wireless enabled portable PC.
 - .2 The converter shall support downloading and troubleshooting FEC and field devices from the PC over the wireless connection.
 - .3 The converter shall employ Bluetooth Wireless Technology.
 - .4 The converter shall be powered through a connection to either the Sensor-Actuator (SA) or the Field Controller (FC) Bus.
 - .5 The converter shall operate over a minimum of thirty three (33) feet within a building.
 - .6 The converter shall have LED indicators to provide information regarding the following conditions:
 - .1 Power - On/Off
 - .2 Fault – Fault/No Fault
 - .3 SA/FC Bus – Bus Activity/ No Bus Activity
 - .4 Blue – Bluetooth Communication Established/ Bluetooth Communication Not Established
 - .7 The SWCVT shall comply with FCC Part 15.247 regulations for low-power unlicensed transmitters.
- .3 Handheld VAV Balancing Sensor (ATV)
 - .1 The sensor shall be a light weight portable device of dimensions not more than 3.2 x 3.2 x 1.0 inches.
 - .2 The sensor shall be capable of displaying data and setting balancing parameters for VAV control applications.
 - .3 The sensor shall be powered through a connection to either the Sensor-Actuator (SA) or the Field Controller (FC) Bus.
 - .4 The sensor shall be a menu driven device that shall modify itself automatically depending upon what type of application resides in the controller.
 - .5 The sensor shall contain a dial and two buttons to navigate through the menu and to set balancing parameters.
 - .6 The sensor shall provide an adjustable time-out parameter that will return the controller to normal operation if the balancing operation is aborted or abandoned.
 - .7 The sensor shall include the following
 - .1 5 foot retractable cable
 - .2 Laminated user guide
 - .3 Nylon carrying case
 - .8 The sensor shall be Underwriters Laboratory UL 916 listed and CSA certified C22.2 N. 205, CFR47.

2.8

INPUT DEVICES

- .1 General Requirements
 - .1 Installation, testing, and calibration of all sensors, transmitters, and other input devices shall be provided to meet the system requirements.
- .2 Temperature Sensors
 - .1 General Requirements:
 - .1 Sensors and transmitters shall be provided, as outlined in the input/output summary and sequence of operations.
 - .2 The temperature sensor shall be of the resistance type, and shall be either two-wire 1000 ohm nickel RTD, or two-wire 1000 ohm platinum RTD.

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- .3 The following point types (and the accuracy of each) are required, and their associated accuracy values include errors associated with the sensor, lead wire, and A to D conversion:

Point Type	Accuracy
Chilled Water	$\pm .5^{\circ}\text{F}$.
Room Temp	$\pm .5^{\circ}\text{F}$.
Duct Temperature	$\pm .5^{\circ}\text{F}$.
All Others	$\pm .75^{\circ}\text{F}$.

- .2 Room Temperature Sensors
- .1 Room sensors shall be constructed for either surface or wall box mounting.
- .2 Room sensors shall have the following options when specified:
- .1 Setpoint reset slide switch providing a ± 3 degree (adjustable) range.
- .2 Individual heating/cooling setpoint slide switches.
- .3 A momentary override request push button for activation of after-hours operation.
- .4 Analog thermometer.
- .3 Room Temperature Sensors with Integral Display
- .1 Room sensors shall be constructed for either surface or wall box mounting.
- .2 Room sensors shall have an integral LCD display and four button keypad with the following capabilities:
- .1 Display room and outside air temperatures.
- .2 Display and adjust room comfort setpoint.
- .3 Display and adjust fan operation status.
- .4 Timed override request push button with LED status for activation of after-hours operation.
- .5 Display controller mode.
- .6 Password selectable adjustment of setpoint and override modes.
- .4 Thermo wells
- .1 When thermo wells are required, the sensor and well shall be supplied as a complete assembly, including wellhead and Greenfield fitting.
- .2 Thermo wells shall be pressure rated and constructed in accordance with the system working pressure.
- .3 Thermo wells and sensors shall be mounted in a thread let or 1/2" NPT saddle and allow easy access to the sensor for repair or replacement.
- .4 Thermo wells shall be constructed of 316 stainless steel.
- .5 Outside Air Sensors
- .1 Outside air sensors shall be designed to withstand the environmental conditions to which they will be exposed. They shall also be provided with a solar shield.
- .2 Sensors exposed to wind velocity pressures shall be shielded by a perforated plate that surrounds the sensor element.
- .3 Temperature transmitters shall be of NEMA 3R construction and rated for ambient temperatures.
- .6 Duct Mount Sensors
- .1 Duct mount sensors shall mount in an electrical box through a hole in the duct, and be positioned so as to be easily accessible for repair or replacement.
- .2 Duct sensors shall be insertion type and constructed as a complete assembly, including lock nut and mounting plate.
- .3 For outdoor air duct applications, a weatherproof mounting box with weatherproof cover and gasket shall be used.
- .7 Averaging Sensors

- .1 For ductwork greater in any dimension that 48 inches and/or where air temperature stratification exists, an averaging sensor with multiple sensing points shall be used.
 - .2 For plenum applications, such as mixed air temperature measurements, a string of sensors mounted across the plenum shall be used to account for stratification and/or air turbulence. The averaging string shall have a minimum of 4 sensing points per 12-foot long segment.
 - .3 Capillary supports at the sides of the duct shall be provided to support the sensing string.
 - .8 Acceptable Manufacturers: Johnson Controls, Setra.
- .3 Humidity Sensors
- .1 The sensor shall be a solid-state type, relative humidity sensor of the Bulk Polymer Design. The sensor element shall resist service contamination.
 - .2 The humidity transmitter shall be equipped with non-interactive span and zero adjustments, a 2-wire isolated loop powered, 4-20 mA, 0-100% linear proportional output.
 - .3 The humidity transmitter shall meet the following overall accuracy, including lead loss and Analog to Digital conversion. 3% between 20% and 80% RH @ 77 Deg F unless specified elsewhere.
 - .4 Outside air relative humidity sensors shall be installed with a rain proof, perforated cover. The transmitter shall be installed in a NEMA 3R enclosure with sealite fittings and stainless steel bushings.
 - .5 A single point humidity calibrator shall be provided, if required, for field calibration. Transmitters shall be shipped factory pre-calibrated.
 - .6 Duct type sensing probes shall be constructed of 304 stainless steel, and shall be equipped with a neoprene grommet, bushings, and a mounting bracket.
 - .7 Acceptable Manufacturers: Johnson Controls, Veris Industries, and Mamac.
- .4 Differential Pressure Transmitters
- .1 General Air and Water Pressure Transmitter Requirements:
 - .1 Pressure transmitters shall be constructed to withstand 100% pressure over-range without damage, and to hold calibrated accuracy when subject to a momentary 40% over-range input.
 - .2 Pressure transmitters shall transmit a 0 to 5 VDC, 0 to 10 VDC, or 4 to 20 mA output signal.
 - .3 Differential pressure transmitters used for flow measurement shall be sized to the flow sensing device, and shall be supplied with Tee fittings and shut-off valves in the high and low sensing pick-up lines to allow the balancing Contractor and Owner permanent, easy-to-use connection.
 - .4 A minimum of a NEMA 1 housing shall be provided for the transmitter. Transmitters shall be located in accessible local control panels wherever possible.
 - .2 Low Differential Water Pressure Applications (0" - 20" w.c.)
 - .1 The differential pressure transmitter shall be of industrial quality and transmit a linear, 4 to 20 mA output in response to variation of flow meter differential pressure or water pressure sensing points.
 - .2 The differential pressure transmitter shall have non-interactive zero and span adjustments that are adjustable from the outside cover and meet the following performance specifications:
 - .1 .01-20" w.c. input differential pressure range.
 - .2 4-20 mA output.
 - .3 Maintain accuracy up to 20 to 1 ratio turndown.
 - .4 Reference Accuracy: +0.2% of full span.
 - .3 Acceptable Manufacturers: Setra and Mamac.
 - .3 Medium to High Differential Water Pressure Applications (Over 21" w.c.)
 - .1 The differential pressure transmitter shall meet the low pressure transmitter specifications with the following exceptions:
 - .1 Differential pressure range 10" w.c. to 300 PSI.

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- .2 Reference Accuracy: $\pm 1\%$ of full span (includes non-linearity, hysteresis, and repeatability).
- .2 Standalone pressure transmitters shall be mounted in a bypass valve assembly panel. The panel shall be constructed to NEMA 1 standards. The transmitter shall be installed in the panel with high and low connections piped and valved. Air bleed units, bypass valves, and compression fittings shall be provided.
- .3 Acceptable Manufacturers: Setra and Mamac.
- .4 Building Differential Air Pressure Applications (-1" to +1" w.c.)
 - .1 The differential pressure transmitter shall be of industrial quality and transmit a linear, 4 to 20 mA output in response to variation of differential pressure or air pressure sensing points.
 - .2 The differential pressure transmitter shall have non-interactive zero and span adjustments that are adjustable from the outside cover and meet the following performance specifications:
 - .1 -1.00 to +1.00 w.c. input differential pressure ranges. (Select range appropriate for system application)
 - .2 4-20 mA output.
 - .3 Maintain accuracy up to 20 to 1 ratio turndown.
 - .4 Reference Accuracy: +0.2% of full span.
 - .3 Acceptable Manufacturers: Johnson Controls and Setra.
- .5 Low Differential Air Pressure Applications (0" to 5" w.c.)
 - .1 The differential pressure transmitter shall be of industrial quality and transmit a linear, 4 to 20 mA output in response to variation of differential pressure or air pressure sensing points.
 - .2 The differential pressure transmitter shall have non-interactive zero and span adjustments that are adjustable from the outside cover and meet the following performance specifications:
 - .1 (0.00 - 1.00" to 5.00") w.c. input differential pressure ranges. (Select range appropriate for system application.)
 - .2 4-20 mA output.
 - .3 Maintain accuracy up to 20 to 1 ratio turndown.
 - .4 Reference Accuracy: +0.2% of full span.
 - .3 Acceptable Manufacturers: Johnson Controls and Setra.
- .6 Medium Differential Air Pressure Applications (5" to 21" w.c.)
 - .1 The pressure transmitter shall be similar to the Low Air Pressure Transmitter, except that the performance specifications are not as severe. Differential pressure transmitters shall be provided that meet the following performance requirements:
 - .1 Zero & span: (c/o F.S./Deg. F): .04% including linearity, hysteresis and repeatability.
 - .2 Accuracy: 1% F.S. (best straight line) Static Pressure Effect: 0.5% F.S. (to 100 PSIG.
 - .3 Thermal Effects: $<+.033$ F.S./Deg. F. over 40°F. to 100°F. (calibrated at 70°F.)
 - .2 Standalone pressure transmitters shall be mounted in a bypass valve assembly panel. The panel shall be constructed to NEMA 1 standards. The transmitter shall be installed in the panel with high and low connections piped and valved. Air bleed units, bypass valves, and compression fittings shall be provided.
 - .3 Acceptable manufacturers: Johnson Controls and Setra.
- .7 Water Flow Monitoring
 - .1 Water flow meters shall be electromagnetic type with integral microprocessor-Based electronics. The meter shall have an accuracy of 0.25%.
 - .2 Acceptable manufacturers: Onicon
- .5 Power Monitoring Devices
 - .1 Current Measurement (Amps)

99% REVIEW

- .1 Current measurement shall be by a combination current transformer and a current transducer. The current transformer shall be sized to reduce the full amperage of the monitored circuit to a maximum 5 Amp signal, which will be converted to a 4-20 mA DDC compatible signal for use by the Facility Management System.
- .2 Current Transformer – A split core current transformer shall be provided to monitor motor amps.
 - .1 Operating frequency – 50 - 400 Hz.
 - .2 Insulation – 0.6 Kv class 10Kv BIL.
 - .3 UL recognized.
 - .4 Five amp secondary.
 - .5 Select current ration as appropriate for application.
 - .6 Acceptable manufacturers: Veris Industries
- .3 Current Transducer – A current to voltage or current to mA transducer shall be provided. The current transducer shall include:
 - .1 6X input over amp rating for AC inrushes of up to 120 amps.
 - .2 Manufactured to UL 1244.
 - .3 Accuracy: +.5%, Ripple +1%.
 - .4 Minimum load resistance 30kOhm.
 - .5 Input 0-20 Amps.
 - .6 Output 4-20 mA.
 - .7 Transducer shall be powered by a 24VDC regulated power supply (24 VDC +5%).
 - .8 Acceptable manufacturers: Veris Industries
- .6 Status and Safety Switches
 - .1 General Requirements
 - .1 Switches shall be provided to monitor equipment status, safety conditions, and generate alarms at the BMS when a failure or abnormal condition occurs. Safety switches shall be provided with two sets of contacts and shall be interlock wired to shut down respective equipment.
 - .2 Current Sensing Switches
 - .1 The current sensing switch shall be self-powered with solid-state circuitry and a dry contact output. It shall consist of a current transformer, a solid state current sensing circuit, adjustable trip point, solid state switch, SPDT relay, and an LED indicating the on or off status. A conductor of the load shall be passed through the window of the device. It shall accept over-current up to twice its trip point range.
 - .2 Current sensing switches shall be used for run status for fans, pumps, and other miscellaneous motor loads.
 - .3 Current sensing switches shall be calibrated to show a positive run status only when the motor is operating under load. A motor running with a broken belt or coupling shall indicate a negative run status.
 - .4 Acceptable manufacturers: Veris Industries
 - .3 Air Filter Status Switches
 - .1 Differential pressure switches used to monitor air filter status shall be of the automatic reset type with SPDT contacts rated for 2 amps at 120VAC.
 - .2 A complete installation kit shall be provided, including: static pressure tops, tubing, fittings, and air filters.
 - .3 Provide appropriate scale range and differential adjustment for intended service.
 - .4 Acceptable manufacturers: Johnson Controls, Cleveland Controls
 - .4 Air Flow Switches
 - .1 Differential pressure flow switches shall be bellows actuated mercury switches or snap acting micro-switches with appropriate scale range and differential adjustment for intended service.
 - .2 Acceptable manufacturers: Johnson Controls, Cleveland Controls
 - .5 Air Pressure Safety Switches

- .1 Air pressure safety switches shall be of the manual reset type with SPDT contacts rated for 2 amps at 120VAC.
- .2 Pressure range shall be adjustable with appropriate scale range and differential adjustment for intended service.
- .3 Acceptable manufacturers: Johnson Controls, Cleveland Controls
- .6 Water Flow Switches
 - .1 Water flow switches shall be equal to the Johnson Controls P74.
- .7 Low Temperature Limit Switches
 - .1 The low temperature limit switch shall be of the manual reset type with Double Pole/Single Throw snap acting contacts rated for 16 amps at 120VAC.
 - .2 The sensing element shall be a minimum of 15 feet in length and shall react to the coldest 18-inch section. Element shall be mounted horizontally across duct in accordance with manufacturers recommended installation procedures.
 - .3 For large duct areas where the sensing element does not provide full coverage of the air stream, additional switches shall be provided as required to provide full protection of the air stream.
 - .4 The low temperature limit switch shall be equal to Johnson Controls A70.

2.9 OUTPUT DEVICES

- .1 Actuators
 - .1 General Requirements
 - .1 Damper and valve actuators shall be electronic and/or pneumatic, as specified in the System Description section.
 - .2 Electronic Damper Actuators
 - .1 Electronic damper actuators shall be direct shaft mount.
 - .2 Modulating and two-position actuators shall be provided as required by the sequence of operations. Damper sections shall be sized Based on actuator manufacturer's recommendations for face velocity, differential pressure and damper type. The actuator mounting arrangement and spring return feature shall permit normally open or normally closed positions of the dampers, as required. All actuators (except terminal units) shall be furnished with mechanical spring return unless otherwise specified in the sequences of operations. All actuators shall have external adjustable stops to limit the travel in either direction and a gear release to allow manual positioning.
 - .3 Modulating actuators shall accept 24 VAC or VDC power supply, consume no more than 15 VA, and be UL listed. The control signal shall be 2-10 VDC or 4-20 mA, and the actuator shall provide a clamp position feedback signal of 2-10 VDC. The feedback signal shall be independent of the input signal and may be used to parallel other actuators and provide true position indication. The feedback signal of one damper actuator for each separately controlled damper shall be wired back to a terminal strip in the control panel for trouble-shooting purposes.
 - .4 Two-position or open/closed actuators shall accept 24 or 120 VAC power supply and be UL listed. Isolation, smoke, exhaust fan, and other dampers, as specified in the sequence of operations, shall be furnished with adjustable end switches to indicate open/closed position or be hard wired to start/stop associated fan. Two-position actuators, as specified in sequences of operations as "quick acting," shall move full stroke within 20 seconds. All smoke damper actuators shall be quick acting.
 - .5 Acceptable manufacturers: Johnson Controls, Mamac.
 - .3 Electronic Valve Actuators
 - .1 Electronic valve actuators shall be manufactured by the valve manufacturer.
 - .2 Each actuator shall have current limiting circuitry incorporated in its design to prevent damage to the actuator.

- .3 Modulating and two-position actuators shall be provided as required by the sequence of operations. Actuators shall provide the minimum torque required for proper valve close-off against the system pressure for the required application. The valve actuator shall be sized Based on valve manufacturer's recommendations for flow and pressure differential. All actuators shall fail in the last position unless specified with mechanical spring return in the sequence of operations. The spring return feature shall permit normally open or normally closed positions of the valves, as required. All direct shaft mount rotational actuators shall have external adjustable stops to limit the travel in either direction.
- .4 Modulating Actuators shall accept 24 VAC or VDC and 120 VAC power supply and be UL listed. The control signal shall be 2-10 VDC or 4-20 mA and the actuator shall provide a clamp position feedback signal of 2-10 VDC. The feedback signal shall be independent of the input signal, and may be used to parallel other actuators and provide true position indication. The feedback signal of each valve actuator (except terminal valves) shall be wired back to a terminal strip in the control panel for trouble-shooting purposes.
- .5 Two-position or open/closed actuators shall accept 24 or 120 VAC power supply and be UL listed. Butterfly isolation and other valves, as specified in the sequence of operations, shall be furnished with adjustable end switches to indicate open/closed position or be hard wired to start/stop the associated pump or chiller.
- .6 Acceptable manufacturers: Johnson Controls
- .2 Control Dampers
 - .1 The BMS Contractor shall furnish all automatic dampers. All automatic dampers shall be sized for the application by the BMS Contractor or as specifically indicated on the Drawings.
 - .2 All dampers used for throttling airflow shall be of the opposed blade type arranged for normally open or normally closed operation, as required. The damper is to be sized so that, when wide open, the pressure drop is a sufficient amount of its close-off pressure drop to shift the characteristic curve to near linear.
 - .3 All dampers used for two-position, open/close control shall be parallel blade type arranged for normally open or closed operation, as required.
 - .4 Damper frames and blades shall be constructed of either galvanized steel or aluminum. Maximum blade length in any section shall be 60". Damper blades shall be 16-gauge minimum and shall not exceed eight (8) inches in width. Damper frames shall be 16-gauge minimum hat channel type with corner bracing. All damper bearings shall be made of reinforced nylon, stainless steel or oil-impregnated bronze. Dampers shall be tight closing, low leakage type, with synthetic elastomer seals on the blade edges and flexible stainless steel side seals. Dampers of 48"x48" size shall not leak in excess of 8.0 cfm per square foot when closed against 4" w.g. static pressure when tested in accordance with AMCA Std. 500.
 - .5 Airfoil blade dampers of double skin construction with linkage out of the air stream shall be used whenever the damper face velocity exceeds 1500 FPM or system pressure exceeds 2.5" w.g., but no more than 4000 FPM or 6" w.g. Acceptable manufacturers are Johnson Controls or TAMCO 9000 for outside air applications or TAMCO 1000 for return air applications.
 - .6 One piece rolled blade dampers with exposed or concealed linkage may be used with face velocities of 1500 FPM or below. Acceptable manufacturers are: Johnson Controls or TAMCO.
- .3 Control Relays
 - .1 Control Pilot Relays
 - .1 Control pilot relays shall be of a modular plug-in design with retaining springs or clips.
 - .2 Mounting Bases shall be snap-mount.

- .3 DPDT, 3PDT, or 4PDT relays shall be provided, as appropriate for application.
- .4 Contacts shall be rated for 10 amps at 120VAC.
- .5 Relays shall have an integral indicator light and check button.
- .6 Acceptable manufacturers: Johnson Controls, Lectro
- .2 Lighting Control Relays
 - .1 Lighting control relays shall be latching with integral status contacts.
 - .2 Contacts shall be rated for 20 amps at 277 VAC.
 - .3 The coil shall be a split low-voltage coil that moves the line voltage contact armature to the ON or OFF latched position.
 - .4 Lighting control relays shall be controlled by:
 - .1 Pulsed Tri-state Output – Preferred method.
 - .2 Pulsed Paired Binary Outputs.
 - .3 A Binary Input to the Facility Management System shall monitor integral status contacts on the lighting control relay. Relay status contacts shall be of the “dry-contact” type.
 - .5 The relay shall be designed so that power outages do not result in a change-of-state, and so that multiple same state commands will simply maintain the commanded state. Example: Multiple OFF command pulses shall simply keep the contacts in the OFF position.
- .4 Control Valves
 - .1 All automatic control valves shall be fully proportioning and provide near linear heat transfer control. The valves shall be quiet in operation and fail-safe open, closed, or in their last position. All valves shall operate in sequence with another valve when required by the sequence of operations. All control valves shall be sized by the control manufacturer, and shall be guaranteed to meet the heating and cooling loads, as specified. All control valves shall be suitable for the system flow conditions and close against the differential pressures involved. Body pressure rating and connection type (sweat, screwed, or flanged) shall conform to the pipe schedule elsewhere in this Specification.
 - .2 Chilled water control valves shall be modulating plug, ball, and/or butterfly, as required by the specific application. Modulating water valves shall be sized per manufacturer’s recommendations for the given application. In general, valves (2 or 3-way) serving variable flow air handling unit coils shall be sized for a pressure drop equal to the actual coil pressure drop, but no less than 5 PSI. Valves (3-way) serving constant flow air handling unit coils with secondary circuit pumps shall be sized for a pressure drop equal to 25% the actual coil pressure drop, but no less than 2 PSI. Mixing valves (3-way) serving secondary water circuits shall be sized for a pressure drop of no less than 5 PSI. Valves for terminal reheat coils shall be sized for a 2 PSIG pressure drop, but no more than a 5 PSI drop.
 - .3 Ball valves shall be used for hot and chilled water applications, water terminal reheat coils, radiant panels, unit heaters, package air conditioning units, and fan coil units except those described hereinafter.
 - .4 Modulating plug water valves of the single-seat type with equal percentage flow characteristics shall be used for all special applications as indicated on the valve schedule. Valve discs shall be composition type. Valve stems shall be stainless steel.
 - .5 Butterfly valves shall be acceptable for modulating large flow applications greater than modulating plug valves, and for all two-position, open/close applications. In-line and/or three-way butterfly valves shall be heavy-duty pattern with a body rating comparable to the pipe rating, replaceable lining suitable for temperature of system, and a stainless steel vane. Valves for modulating service shall be sized and travel limited to 50 degrees of full open. Valves for isolation service shall be the same as the pipe. Valves in the closed position shall be bubble-tight.
 - .6 Acceptable manufacturers: Johnson Controls
- .5 Electronic Signal Isolation Transducers
 - .1 A signal isolation transducer shall be provided whenever an analog output signal from the BMS is to be connected to an external control system as an input (such

- as a chiller control panel), or is to receive as an input signal from a remote system.
- .2 The signal isolation transducer shall provide ground plane isolation between systems.
- .3 Signals shall provide optical isolation between systems.
- .4 Acceptable manufacturers: Advanced Control Technologies
- .6 External Manual Override Stations
 - .1 External manual override stations shall provide the following:
 - .1 An integral HAND/OFF/AUTO switch shall override the controlled device pilot relay.
 - .2 A status input to the Facility Management System shall indicate whenever the switch is not in the automatic position.
 - .3 A Status LED shall illuminate whenever the output is ON.
 - .4 An Override LED shall illuminate whenever the HOA switch is in either the HAND or OFF position.
 - .5 Contacts shall be rated for a minimum of 1 amp at 24 VAC.
 - .2 Electronic/Pneumatic Transducers
 - .1 Electronic to Pneumatic transducers shall provide:
 - .1 Output: 3-15 PSIG.
 - .2 Input: 4-20 mA or 0-10 VDC.
 - .3 Manual output adjustment.
 - .4 Pressure gauge.
 - .5 External replaceable supply air filter.
 - .6 Acceptable manufacturers: Johnson Controls, Mamac

2.10 MISCELLANEOUS DEVICES

- .1 Local Control Panels
 - .1 All control panels shall be factory constructed, incorporating the BMS manufacturer's standard designs and layouts. All control panels shall be UL inspected and listed as an assembly and carry a UL 508 label listing compliance. Control panels shall be fully enclosed, with perforated sub-panel, hinged door, and slotted flush latch.
 - .2 In general, the control panels shall consist of the DDC controller(s), display module as specified and indicated on the plans, and I/O devices—such as relays, transducers, and so forth—that are not required to be located external to the control panel due to function. Where specified the display module shall be flush mounted in the panel face unless otherwise noted.
 - .3 All I/O connections on the DDC controller shall be provide via removable or fixed screw terminals.
 - .4 Low and line voltage wiring shall be segregated. All provided terminal strips and wiring shall be UL listed, 300-volt service and provide adequate clearance for field wiring.
 - .5 All wiring shall be neatly installed in plastic trays or tie-wrapped.
 - .6 A convenience 120 VAC duplex receptacle shall be provided in each enclosure, fused on/off power switch, and required transformers.
- .2 Power Supplies
 - .1 DC power supplies shall be sized for the connected device load. Total rated load shall not exceed 75% of the rated capacity of the power supply.
 - .2 Input: 120 VAC +10%, 60Hz.
 - .3 Output: 24 VDC.
 - .4 Line Regulation: +0.05% for 10% line change.
 - .5 Load Regulation: +0.05% for 50% load change.
 - .6 Ripple and Noise: 1 mV rms, 5 mV peak to peak.
 - .7 An appropriately sized fuse and fuse block shall be provided and located next to the power supply.
 - .8 A power disconnect switch shall be provided next to the power supply.
- .3 Thermostats

- .1 Electric room thermostats of the heavy-duty type shall be provided for unit heaters, cabinet unit heaters, and ventilation fans, where required. All these items shall be provided with concealed adjustment. Finish of covers for all room-type instruments shall match and, unless otherwise indicated or specified, covers shall be manufacturer's standard finish.

Part 3 PERFORMANCE/EXECUTION

3.1 BMS SPECIFIC REQUIREMENTS

- .1 Graphic Displays
- .1 Provide a color graphic system flow diagram display for each system with all points as indicated on the point list. All terminal unit graphic displays shall be from a standard design library.
- .2 User shall access the various system schematics via a graphical penetration scheme and/or menu selection.
- .2 Custom Reports:
- .1 Provide custom reports as required for this project:
- .3 Actuation / Control Type
- .1 Primary Equipment
- .1 Controls shall be provided by equipment manufacturer as specified herein.
- .2 All damper and valve actuation shall be electric.
- .2 Air Handling Equipment
- .1 All air handlers shall be controlled with a HVAC-DDC Controller
- .2 All damper and valve actuation shall be electric.
- .3 Terminal Equipment:
- .1 Terminal Units (VAV, UV, etc.) shall have electric damper and valve actuation.
- .2 All Terminal Units shall be controlled with HVAC-DDC Controller)

3.2 INSTALLATION PRACTICES

- .1 BMS Wiring
- .1 All conduit, wiring, accessories and wiring connections required for the installation of the Building Management System, as herein specified, shall be provided by the BMS Contractor unless specifically shown on the Electrical Drawings under Division 16 Electrical. All wiring shall comply with the requirements of applicable portions of Division 16 and all local and national electric codes, unless specified otherwise in this section.
- .2 All BMS wiring materials and installation methods shall comply with BMS manufacturer recommendations.
- .3 The sizing, type and provision of cable, conduit, cable trays, and raceways shall be the design responsibility of the BMS Contractor. If complications arise, however, due to the incorrect selection of cable, cable trays, raceways and/or conduit by the BMS Contractor, the Contractor shall be responsible for all costs incurred in replacing the selected components.
- .4 Class 2 Wiring
- .1 All Class 2 (24VAC or less) wiring shall be installed in conduit unless otherwise specified.
- .2 Conduit is not required for Class 2 wiring in concealed accessible locations. Class 2 wiring not installed in conduit shall be supported every 5' from the building structure utilizing metal hangers designed for this application. Wiring shall be installed parallel to the building structural lines. All wiring shall be installed in accordance with local code requirements.
- .5 Class 2 signal wiring and 24VAC power can be run in the same conduit. Power wiring 120VAC and greater cannot share the same conduit with Class 2 signal wiring.

- .6 Provide for complete grounding of all applicable signal and communications cables, panels and equipment so as to ensure system integrity of operation. Ground cabling and conduit at the panel terminations. Avoid grounding loops.
- .2 BMS Line Voltage Power Source
 - .1 120-volt AC circuits used for the Building Management System shall be taken from panel boards and circuit breakers provided by Division 16.
 - .2 Circuits used for the BMS shall be dedicated to the BMS and shall not be used for any other purposes.
 - .3 DDC terminal unit controllers may use AC power from motor power circuits.
- .3 BMS Raceway
 - .1 All wiring shall be installed in conduit or raceway except as noted elsewhere in this specification. Minimum control wiring conduit size 1/2".
 - .2 Where it is not possible to conceal raceways in finished locations, surface raceway (Wiremold) may be used as approved by the Architect.
 - .3 All conduits and raceways shall be installed level, plumb, at right angles to the building lines and shall follow the contours of the surface to which they are attached.
 - .4 Flexible Metal Conduit shall be used for vibration isolation and shall be limited to 3 feet in length when terminating to vibrating equipment. Flexible Metal Conduit may be used within partition walls. Flexible Metal Conduit shall be UL listed.
- .4 Penetrations
 - .1 Provide fire stopping for all penetrations used by dedicated BMS conduits and raceways.
 - .2 All openings in fire proofed or fire stopped components shall be closed by using approved fire resistive sealant.
 - .3 All wiring passing through penetrations, including walls shall be in conduit or enclosed raceway.
 - .4 Penetrations of floor slabs shall be by core drilling. All penetrations shall be plumb, true, and square.
- .5 BMS Identification Standards
 - .1 Node Identification. All nodes shall be identified by a permanent label fastened to the enclosure. Labels shall be suitable for the node location.
 - .2 Cable types specified in Item A shall be color coded for easy identification and troubleshooting.
- .6 BMS Panel Installation
 - .1 The BMS panels and cabinets shall be located as indicated at an elevation of not less than 2 feet from the bottom edge of the panel to the finished floor. Each cabinet shall be anchored per the manufacturer's recommendations.
 - .2 The BMS contractor shall be responsible for coordinating panel locations with other trades and electrical and mechanical contractors.
- .7 Input Devices
 - .1 All Input devices shall be installed per the manufacturer recommendation
 - .2 Locate components of the BMS in accessible local control panels wherever possible.
- .8 HVAC Input Devices – General
 - .1 All Input devices shall be installed per the manufacturer recommendation
 - .2 Locate components of the BMS in accessible local control panels wherever possible.
 - .3 The mechanical contractor shall install all in-line devices such as temperature wells, pressure taps, airflow stations, etc.
 - .4 Input Flow Measuring Devices shall be installed in strict compliance with ASME guidelines affecting non-standard approach conditions.
 - .5 Outside Air Sensors
 - .1 Sensors shall be mounted on the North wall to minimize solar radiant heat impact or located in a continuous intake flow adequate to monitor outside air conditions accurately.
 - .2 Sensors shall be installed with a rain proof, perforated cover.
 - .6 Water Differential Pressure Sensors

- .1 Differential pressure transmitters used for flow measurement shall be sized to the flow-sensing device.
- .2 Differential pressure transmitters shall be supplied with tee fittings and shut-off valves in the high and low sensing pick-up lines.
- .3 The transmitters shall be installed in an accessible location wherever possible.
- .7 Medium to High Differential Water Pressure Applications (Over 21" w.c.):
 - .1 Air bleed units, bypass valves and compression fittings shall be provided.
- .8 Building Differential Air Pressure Applications (-1" to +1" w.c.):
 - .1 Transmitters' exterior sensing tip shall be installed with a shielded static air probe to reduce pressure fluctuations caused by wind.
 - .2 The interior tip shall be inconspicuous and located as shown on the drawings.
- .9 Air Flow Measuring Stations:
 - .1 Where the stations are installed in insulated ducts, the airflow passage of the station shall be the same size as the inside airflow dimension of the duct.
 - .2 Station flanges shall be two inch to three inch to facilitate matching connecting ductwork.
- .10 Duct Temperature Sensors:
 - .1 Duct mount sensors shall mount in an electrical box through a hole in the duct and be positioned so as to be easily accessible for repair or replacement.
 - .2 The sensors shall be insertion type and constructed as a complete assembly including lock nut and mounting plate.
 - .3 For ductwork greater in any dimension than 48 inches or where air temperature stratification exists such as a mixed air plenum, utilize an averaging sensor.
 - .4 The sensor shall be mounted to suitable supports using factory approved element holders.
- .11 Space Sensors:
 - .1 Shall be mounted per ADA requirements.
 - .2 Provide lockable tamper-proof covers in public areas and/or where indicated on the plans.
- .12 Low Temperature Limit Switches:
 - .1 Install on the discharge side of the first water or steam coil in the air stream.
 - .2 Mount element horizontally across duct in a serpentine pattern insuring each square foot of coil is protected by 1 foot of sensor.
 - .3 For large duct areas where the sensing element does not provide full coverage of the air stream, provide additional switches as required to provide full protection of the air stream.
- .13 Air Differential Pressure Status Switches:
 - .1 Install with static pressure tips, tubing, fittings, and air filter.
- .14 Water Differential Pressure Status Switches:
 - .1 Install with shut off valves for isolation.
- .9 HVAC Output Devices
 - .1 All output devices shall be installed per the manufacturers recommendation. The mechanical contractor shall install all in-line devices such as control valves, dampers, airflow stations, pressure wells, etc.
 - .2 Actuators: All control actuators shall be sized capable of closing against the maximum system shut-off pressure. The actuator shall modulate in a smooth fashion through the entire stroke. When any pneumatic actuator is sequenced with another device, pilot positioners shall be installed to allow for proper sequencing.

- .3 Control Dampers: Shall be opposed blade for modulating control of airflow. Parallel blade dampers shall be installed for two position applications.
- .4 Control Valves: Shall be sized for proper flow control with equal percentage valve plugs. The maximum pressure drop for water applications shall be 5 PSI. The maximum pressure drop for steam applications shall be 7 PSI.
- .5 Electronic Signal Isolation Transducers: Whenever an analog output signal from the Building Management System is to be connected to an external control system as an input (such as a chiller control panel), or is to receive as an input a signal from a remote system, provide a signal isolation transducer. Signal isolation transducer shall provide ground plane isolation between systems. Signals shall provide optical isolation between systems.

3.3 TRAINING

- .1 The BMS contractor shall provide the following training services:
 - .1 One day of on-site orientation by a system technician who is fully knowledgeable of the specific installation details of the project. This orientation shall, at a minimum, consist of a review of the project as-built drawings, the BMS software layout and naming conventions, and a walk through of the facility to identify panel and device locations.

3.4 COMMISSIONING

- .1 Fully commission all aspects of the Building Management System work.
- .2 Acceptance Check Sheet
 - .1 Prepare a check sheet that includes all points for all functions of the BMS as indicated on the point list included in this specification.
 - .2 Submit the check sheet to the Engineer for approval
 - .3 The Engineer will use the check sheet as the basis for acceptance with the BMS Contractor.
- .3 VAV box performance verification and documentation:
 - .1 The BMS Contractor shall test each VAV box for operation and correct flow. At each step, after a settling time, box air flows and damper positions will be sampled. Following the tests, a pass/fail report indicating results shall be produced. Possible results are Pass, No change in flow between full open and full close, Reverse operation or Maximum flow not achieved. The report shall be submitted as documentation of the installation.
 - .2 The BMS Contractor shall issue a report based on a sampling of the VAV calculated loop performance metrics. The report shall indicate performance criteria, include the count of conforming and non-conforming boxes, list the non-conforming boxes along with their performance data, and shall also include graphical representations of performance.

END OF SECTION

Part 1 General

1.1 RELATED SECTIONS

- .1 26 05 02 - Electrical Service and Distribution.
- .2 26 05 03 – Lighting, Power and Branch Wiring.
- .3 26 05 04 – Electrical Controls & Instrumentation.
- .4 27 05 13 – Communications Services
- .5 28 13 00 – Electronic Safety and Security

1.2 REFERENCES

- .1 American Society of Mechanical Engineers (ASME)
 - .1 ANSI/ASME A13.1-96, Scheme for the Identification of Piping Systems.
- .2 Canadian Standards Association (CSA International)
 - .1 CAN/CSA-B651-04, Accessible Design for the Built Environment.
 - .2 CSA C22.1-09, Canadian Electrical Code Part I, Safety Standard for Electrical Installations and CE Code Handbook. Amendments for Provinces.
 - .3 CSA C22.2 No.0-M91(R2001), General Requirements - Canadian Electrical Code Part II.
 - .4 CAN/CSA-C22.3 No.3-98(R2003), Electrical Co-ordination.
 - .5 CAN3 C235-83(R2000), Preferred Voltage Levels for AC Systems, 0 to 50,000 V.
- .3 Manitoba Workplace Safety & Health/Workplace Hazardous Materials Information System (WHMIS)
 - .1 Material Safety Data Sheets (MSDS).
- .4 National Research Council of Canada
 - .1 Model National Energy Code of Canada for Buildings.
- .5 Underwriters' Laboratories of Canada (ULC)

1.3 DESIGN AND PERFORMANCE REQUIREMENTS

- .1 Underground Electrical Service: CSA C22.3 No.1 and CAN/CSA-C22.3 No.3.
- .2 Design equipment, components, and assemblies to operate satisfactorily at 60 Hz, within normal operating limits established within CAN3 C235.
- .3 Provide equipment designed to operate in extreme operating limits specified in CAN3 C235, without damage to equipment or failure of service.
- .4 Barrier-Free access: design equipment and components in accordance with CAN/CSA-B651.
- .5 Comply with the Model National Energy Code of Canada for Buildings.

1.4 SUBMITTALS

- .1 Submit product data in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Submit requested documentation to the Authority having jurisdiction and the Contract Administrator.
- .3 Submit Workplace Safety and Health documentation including Workplace Hazardous Materials Information System (WHMIS) MSDS - Material Safety Data Sheets acceptable to Manitoba Workplace Safety and Health for applicable electrical equipment and material. Indicate applicable VOC content.

1.5 SHOP DRAWINGS

- .1 Submit shop drawings in accordance with Section 01 33 00 - Submittal Procedures.
 - .1 Shop drawings: submit drawings stamped and signed by professional engineer registered or licensed in the Province of Manitoba, Canada.
- .2 Indicate project layout, including details of lighting and power system structure, including wiring schematic diagrams. Indicate dimensions, capacities, weights and performance characteristics.
- .3 Indicate product and material data detailing of electrical and electronic equipment.

1.6 SAMPLES

- .1 Submit samples in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Submit duplicate samples of equipment and components are to be submitted where requested.
- .3 After review and acceptance, samples will be returned for incorporation into work.

1.7 DESIGN DATA

- .1 Submit design data in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Submit design calculations for the following:
 - .1 Lighting level, interior and exterior, luminance plots.
 - .2 Estimated electrical energy demand (summer, winter), showing connected load and diversified demand.
 - .3 Voltage drop, as designed and at ultimate capacity.
 - .4 Energy budget (LEED).
 - .5 Lighting power density (W/m²).
 - .6 Fault level calculations.
 - .7 Coordination study.
 - .8 Site and floor plans showing security perimeter levels and their integration with the access control, intrusion detection and CCTV field devices and control devices.

1.8 CERTIFICATES

- .1 Submit inspection reports and certificates of acceptance from authorities having jurisdiction to the Contract Administrator at Substantial Completion.
- .2 Obtain and pay for necessary permits, licenses, inspections and fees required.

1.9 CLOSEOUT SUBMITTALS

- .1 Submit operation and maintenance data for incorporation into manual specified in Section 01 78 00 - Closeout Submittals.
- .2 Include accurate as-built drawings. As-built drawings are to show raceway locations and raceway usage.
- .3 Submit two electronic copies and two paper sets of drawings and specifications.
- .4 Manufacturer's installation instructions: submit instructions for installation and operation of products, components, and assemblies.
- .5 Submit operation and maintenance manuals for electrical and electronic equipment. Including details of design elements, component function and maintenance requirements to effectively operate, maintain or repair.
- .6 Include technical data, product data, component illustrations, technical descriptions and parts list, wiring and schematic diagrams not considered proprietary, test and verification reports.

1.10 QUALITY ASSURANCE

- .1 Utilize design and installation personnel thoroughly familiar with systems of this type.
- .2 Health and Safety:
 - .1 Do construction occupational health and safety in accordance with Manitoba Workplace Safety and Health Requirements.
- .3 COR Certification:
 - .1 All member of the design/build team are to be COR Certified to participate in the design, construction or commissioning.

1.11 WASTE MANAGEMENT AND DISPOSAL

- .1 Construction/Demolition Waste Management and Disposal: separate waste materials for reuse and recycling in accordance with Section 01 74 21 - Construction/Demolition Waste Management and Disposal.
- .2 Maintain documentation on total waste in tonnes and the weight of reusable and recycled material in tonnes for submission and achieving the LEED® Credit 2.2 for Materials & Resources: Construction Waste Management – Divert 75% from Landfill.

1.12 WARRANTY

- .1 Refer to contractual documents for warranty duration.
- .2 Refer to individual specification sections for an enhanced warranty period for particular systems if required.

1.13 MATERIALS AND EQUIPMENT

- .1 Equipment:
 - .1 CSA approved and ULC certified where applicable.
 - .2 Where CSA or ULC designation is not available, obtain approval from local authority having jurisdiction.
- .2 Ensure labels are visible and legible after equipment is installed.
- .3 Factory assemble control panels and component assemblies.

1.14 FINISHES

- .1 Shop finish metal enclosure surfaces by application of rust resistant primer inside and outside, and two coats of finish enamel ASA61 Grey or Galvanized
 - .1 Paint outdoor electrical equipment "equipment" ASA61 Grey finish to EEMAC Y1-1.
 - .2 Paint indoor switchgear and distribution enclosures light grey to EEMAC 2Y-1.
 - .3 Paint recessed and surface panel board covers in non service areas to match wall finish.

1.15 EQUIPMENT IDENTIFICATION

- .1 Identify electrical equipment with nameplates.
- .2 Nameplates:
 - .1 Lamicoid 3 mm thick plastic engraving sheet, black face, white core, mechanically attached with self tapping screws.
 - .2 NAMEPLATE SIZES

Size 3	3 mm high letters
Size 5	5 mm high letters
Size 6	6 mm high letters
Size 8	8 mm high letters
Size 10	10 mm high letters
Size 12	12 mm high letters
- .3 Allow for average of twenty-five letters per nameplate.
- .4 Identification to be English.
- .5 Nameplates to indicate system and/or voltage characteristics.
- .6 Main distribution and Sub distributions, Size 12: indicate name, system and voltage, calculated fault level, feeder length and size.
- .7 Disconnects, starters and contactors, Size 8: indicate equipment being controlled voltage and circuit.
- .8 Transformers, Size 12: indicate name, capacity, primary and secondary voltages, fed from feeds.
- .9 Receptacles, Size 3: circuit.

1.16 WIRING IDENTIFICATION

- .1 Identify wiring with permanent indelible identifying markings, either numbered or coloured plastic tapes, on both ends of phase conductors of feeders and branch circuit wiring.
- .2 Maintain phase sequence and colour coding throughout.
- .3 Colour code: to CSA C22.1
- .4 Use colour coded wires for fire alarm and communication cables, matched throughout.

1.17 CONDUIT AND CABLE IDENTIFICATION

- .1 Colour code conduits, boxes and metallic sheathed cables.
- .2 Code with paint at points where conduit or cable enters wall, ceiling or floor, and at 15 m intervals.
- .3 Colours: 25 mm wide prime colour and 20 mm wide auxiliary colour.
- .4

System	Prime	Auxiliary
up to 250 V	Yellow	
up to 600 V	Yellow	Green
up to 5 kV	Yellow	Blue
up to 15 kV	Yellow	Red
Telecommunication		
Systems	Green	
Fire Alarm	Red	
Security	Orange	
- .2 Provide identification of equipment, components, and assemblies specified, using materials suitable to withstand anticipated operating environment.

1.18 FIELD QUALITY CONTROL

- .1 Confirm other related work is complete to receive work of this and related electrical sections.
- .2 Commission electrical systems.
- .3 Qualifications:
 - .1 Electricians: qualified, licensed electricians or apprentices in accordance with Provincial Act respecting manpower vocational training and qualifications.
- .4 Apprentices: employees registered in provincial apprentices program permitted, under direct supervision of qualified licensed electrician, to perform specific tasks. Permitted activities determined based on level of training attained and demonstration of ability to perform specific duties.

1.19 INSTALLATION

- .1 Comply with manufacturer's written data, including product technical bulletins, product catalog installation instructions, product carton installation instructions, MSDS, and product datasheets.
- .2 Protect electrical equipment from dust and dirt. Plug or cap openings in conduit, fixtures and equipment during construction with Contract Administrator approved materials.
- .3 Set equipment and components plumb and level, accurate to position intended, and position hanger rods plumb.

1.20 HEAVE AND SETTLEMENT

- .1 Underground services and supports are to be designed to accommodate heave and settlement which is expected to occur on this Remediated site or the Design Build Team's site.
- .2 Provide connections to power door operators as required.

1.21 ACCESSIBLE DESIGN

- .1 Installation shall satisfy City of Winnipeg Accessible Design requirements.
- .2 Provide connections to power door operators as required.

1.22 EQUIPMENT HEIGHTS

- .1 City of Winnipeg Accessible Design requirements take precedence over this section.
- .2 Equipment mounting height, from finished floor to centerline of equipment item:
 - .1 Local switches: 1200 mm.
 - .2 Wall receptacles, general: 400 mm.
 - .3 Receptacles above top of counters or splashback: 175 mm.
 - .4 Receptacle above top of electric baseboard: 200 mm.
 - .5 Receptacles in mechanical rooms: 1400 mm.
 - .6 Panelboards: as required by Code or as indicated.
 - .1 1800 mm from the top of panel to floor.
 - .2 Bottom of panel, minimum 150 mm above floor.
 - .3 Where multiple panelboards are mounted together, align tops or trims of panelboards, with highest panel board determining height.
 - .7 General telephone, interphone and cable TV outlets: 400 mm.
 - .8 Wall mounted telephone and interphone: 1200 mm.
 - .9 Fire alarm stations: 1200 mm.
 - .10 Wall mounted fire alarm, horns, wall mounted speakers and clocks: 2100 mm.
 - .11 Emergency lighting battery units: 2400 mm.
 - .12 Wall mounted dry type transformers: 2400 mm from bottom.
 - .13 Time switches: 1200 mm.
 - .14 Individual starters: 1500 mm from top. Where multiple starters are mounted together, align starter tops with highest starter determining height.
- .3 Attach electrical equipment, components and devices directly to structure and structural supporting elements.

1.23 VERIFICATION

- .1 Measure phase current to panelboards with normal loads operating at time of acceptance. Adjust branch circuit connections as required to obtain best balance of current between phases and record changes.
- .2 Measure phase voltages at loads and adjust transformer taps to within 2% of rated voltage of equipment.
- .3 Submit report, at completion of measurements, listing phase and neutral currents on panelboards, dry-type transformers and motor control centres, operating under normal load. Include hour and date on which load was measured, and voltage at time of test.

1.24 FIELD TESTS

- .1 Provide advance notice to Design Build Team Engineer and Contract Administrator of proposed testing schedule.
- .2 Perform tests at time of acceptance of work.
- .3 Conduct and pay for field tests:
 - .1 Power distribution, including phase voltage, grounding and load balancing.
 - .2 Circuits originating from branch distribution panels.
 - .3 Lighting and lighting control.
 - .4 Motors, heaters and associated control equipment, including sequenced operation.
 - .5 Fire alarm and communications (and their interface) systems.
 - .6 Telecommunications cabling.

- .4 Perform tests in presence of Design Build Team Engineer and Contract Administrator.
 - .1 Provide instruments, meters, equipment and personnel required to conduct required tests.
 - .2 Test systems to verify operation as specified.
- .5 Conduct di-electric tests, hi-pot tests, ground resistance tests, insulation resistance tests and ground continuity tests as required by nature of various systems and equipment.
- .6 Perform following tests on completed power systems:
 - .1 Control and switching: test circuits for correct operation of devices, switches and controls.
 - .2 Polarity tests: test circuits for correct operation of devices, switches and controls.
 - .3 Voltage tests: test voltage at last outlet of each circuit; maximum potential drop 2% on 120 V, and 208 V branch circuits, 2% on 208 V feeder circuits, and 5% on 600 V feeder circuits. Correct deficiencies.
 - .4 Phase balance: measure load on each phase at switchboards, splitter, distribution panel board and lighting and power panel board.
 - .1 Submit results to Design Build Team Engineer in writing.
 - .2 Re-arrange phase connections as necessary to balance load on each phase as instructed by Design Build Team Engineer.
 - .3 After marking such changes, submit revised drawings showing modified connections to Design Build Team Engineer.
 - .5 Supply voltage: measure line voltage of each phase at load terminals of main breakers and report results in writing to Design Build Team Engineer. Perform test with majority of electrical equipment in use.
 - .6 Insulation resistance tests:
 - .1 Megger circuits, feeders and equipment up to 350 V with a 500 V instrument.
 - .2 Megger 350-600 V circuits, feeders and equipment with a 1000 V instrument.
 - .3 Check resistance to ground before energizing.
- .7 General operations: energize and operate electrical circuit and item. Repair, alter, replace, test and adjust as necessary for a complete and operating electrical system.
- .8 Immediately prior to occupancy, test entire electrical system by performing loss and return of utility power test. Demonstrate operation of:
 - .1 Low voltage service equipment and metering.
 - .2 Exit and emergency lighting.
 - .3 Fire and intrusion alarm operation during power outage, including remote monitoring system.
 - .4 Access control and intrusion detection.
 - .5 CCTV system.
 - .6 System shut down and auto restart, including restabilization of systems after power return.
 - .7 User equipment shut-down and auto-restart.
 - .8 Attach report printouts as evidence of expected operation on systems.

1.25

TEST RESULTS

- .1 Submit test results with O&M Manual.
- .2 Remove and replace conductors found damaged, with new materials.
- .3 Provide required labour and tools, if during testing Design Build Team Engineer requests equipment be opened and removed from their housings to examine equipment, terminations and connections.

1.26 TRAINING

- .1 Train operating personnel in operation, care and maintenance of electrical equipment.
- .2 Obtain and submit written confirmation from operating personnel that satisfactory training has been received.
- .3 Provide one day training session for following systems.
 - .1 Fire Alarm.
 - .2 Card access and Intrusion system.
 - .3 Telecommunication systems.
 - .4 Electrical distribution, control & instrumentation.

1.27 CLEANING

- .1 Perform final cleaning of electrical equipment, systems and components.

1.28 PRODUCT STANDARDS

- .1 Where products are indicated, the following definitions apply:
 - .1 Acceptable manufacturers: only products supplied by the indicated manufacturers are to be provided.
 - .2 Standard of acceptance: the listed product or manufacturer provides the required features. Alternate manufacturers can be utilized provided they also provide the same features as the listed product or manufacturer. The Design Build Team may be asked to submit proof that the alternate product meets the standard of acceptance.

Part 2 PRODUCTS

2.1 SUSTAINABLE REQUIREMENTS

- .1 Use only low emitting adhesives, caulking, paint, coatings and sealants to meet LEED® Credits 4.1 and 4.2 under Indoor Environmental Quality: Low Emitting Materials.

2.2 SPRINKLER PROOF

- .1 All major electrical equipment are to be sprinkler proof. This shall include but not be limited to:
 - .1 Main distribution, sub-distribution and surface mounted panelboards.
 - .2 Transformers.
 - .3 Motor control centres and discrete starters.
- .2 Top entry shall utilize waterproof connectors.

Part 3 EXECUTION

3.1 FIELD QUALITY CONTROL

- .1 Verification requirements in accordance with Section 01 47 17 - Sustainable Requirements: Design Build Team's Verification, include:
 - .2 Materials and resources.
 - .3 Storage and collection of recyclables.
 - .4 Construction waste management.
 - .5 Resource reuse.
 - .6 .Recycled content.
 - .7 Local/regional materials.
 - .8 Low-emitting materials.

3.2 CLEANING

- .1 Proceed in accordance with Section 01 74 11 - Cleaning.
- .2 Upon completion and verification of performance of installation, remove surplus materials, excess materials, rubbish, tools and equipment.

END OF SECTION

Part 1

General

1.1

RELATED SECTIONS

- .1 Power Distribution.
- .2 Auxiliary Power.
- .3 Uninterruptible Power Supply.
- .4 Ground System.
- .5 Surge Protection.
- .6 Lightning Protection.
- .7 Service Rooms.
- .8 Underground Site Services.

1.2

RELATED SECTIONS

- .1 Division 1.
- .2 Section 26 05 01 – Common Requirements – Electrical.
- .3 Section 26 05 03 – Lighting, Power, and Branch Circuit Wiring.
- .4 Section 26 05 04 – Electrical controls and Instrumentation.

1.3

DESIGN AND PERFORMANCE REQUIREMENTS

- .1 Power Distribution:
 - .1 Future loads:
 - .1 Include electrical loading for future Facilities in calculated demand. Do not include this in spare capacity.
 - .2 Winnipeg Fleet Management Agency – Future Facilities:
 - .1 Refueling Centre.
 - .3 Streets Maintenance – Future Facilities:
 - .1 Sand & Salt Storage Facility.
 - .2 Calculated demand, is the demand for the current tenants of the site plus the demand of the future tenants.
 - .3 Spare capacity:
 - .1 Spare capacity shall be calculated as a percentage of calculated demand (Current tenants + future tenants)
 - .2 Main Distribution: 30% breaker space, 30% spare capacity of calculated demand.
 - .3 Sub-distribution: 40% breaker space, 35% spare capacity of calculated demand.
 - .4 Utilization panelboards: 50% breaker space, 40% spare capacity of calculated demand.
 - .5 Transformers: sized to accommodate the spare capacity of the downstream distribution.
 - .4 Voltage drop:
 - .1 Based on calculated demand, maximum voltage drop from consumers terminal to point of utilization shall be 3.6%.
 - .2 Maximum voltage drop for calculated demand plus 30% shall be 5% and satisfy CEC 8-102.
 - .3 Refer also to ASHRAE/IESNA 90.1-2004 voltage drop requirements.
 - .5 Provide underground service from utility pad mounted transformer to service entrance board.
 - .6 Circuit breakers:
 - .1 Adjustable trip electronic breaker for main breaker and auxiliary power main sub-distribution with loss of phase protection.
 - .2 Provide adjustable electronic breakers as required in sub-distribution to achieve coordination.
 - .3 If service size requires ground fault protection, provide ground fault on sub-distributions and utilize instantaneous zone coordination.

- .4 Series rated circuit breakers are not to be utilized.
- .7 Mechanical Equipment:
 - .1 Provide motor control equipment and starters.
 - .2 Use K-13 rated transformers for electrical panel dedicated to main telecom room only.
- .2 Auxiliary Power.
 - .1 Integral sub-base fuel tank.
 - .2 Run time at full connected load:
 - .1 12 hours.
 - .3 Generator run and common trouble annunciated at City of Winnipeg Central Monitoring Facility via Building Automation system.
 - .4 Spare capacity:
 - .1 20% spare capacity on top of calculated demand.
 - .5 Areas and equipment requiring auxiliary power:
 - .1 No area shall be left in complete darkness upon failure of utility power. Average lighting level along the path of egress shall be the level required by emergency lighting.
 - .2 Dedicated K13 transformer for main telecom room.
 - .3 Egress signage.
 - .4 Building mounted exterior lights on main building.
- .3 Ground System.
 - .1 Electrical ground system shall consist of ground rods installed at each corner of the building interconnected by uninsulated copper conductor and connected to the main electrical room and sub-electrical room ground buses. In the current "L" shaped building configuration this will require six ground rods.
 - .2 Connect main electrical room ground bus to main distribution point of common coupling.
 - .3 Telecommunication ground system shall consist of insulated ground bus, one in each telecommunication room interconnected in star configuration by insulated copper conductors. Connect main telecom room bus to main electrical room ground bus.
- .4 Surge Protection.
 - .1 Provide surge suppression where electrical and telecommunication services enter the building.
 - .2 This includes but is not limited to:
 - .1 Electrical Power Service Entrance
 - .2 Telephone Service Entrance by utility
 - .3 Cable Television Service Entrance by utility
 - .4 Site Power Distributions.
 - .5 Site Lighting.
 - .6 Site Telecommunications and Security.
 - .7 Intercom system call stations at gate.
 - .3 Design surge protection bonding to minimize impedance of bonding at typical surge event frequency.
- .5 Lightning Protection
 - .1 Not required.
- .6 Service Rooms.
 - .1 Locate service rooms strategically to provide maximum flexibility for systems and easy access to floor area served.
 - .2 Electrical Service Rooms.
 - .1 Locate main electrical room centrally.
 - .2 Provide space in main electrical room for future power factor correction unit.
 - .3 Telecommunication Service Rooms.
 - .1 Provide dedicated spaces to house telecommunication equipment.
 - .2 Provide space to accommodate equipment for future tenants.

- .4 Provide painted plywood backboards behind all wall mounted equipment.
Plywood is to extend 300 mm beyond perimeter of equipment.
- .7 Underground Site Services.
 - .1 All site services installed underground are to be approved for hazardous locations
 - .2 Provide raceways for power, communications, electronic safety and security systems from service rooms to 3 meters inside the boundary of each of the future tenant areas. Mark on as-built drawings.
 - .3 See also 26 05 03, spare raceway.
- 1.4 SUBMITTALS**
 - .1 Submit product in accordance with Section 01330 - Submittal Procedures.
 - .2 .Submit WHMIS MSDS - Material Safety Data Sheets acceptable to Manitoba Workplace Safety and Health Standards for applicable electrical equipment and material. Indicate applicable VOC content.
- 1.5 SHOP DRAWINGS**
 - .1 Submit shop drawings in accordance with Section 01 33 00 - Submittal Procedures.
 - .2 Indicate project layout, details of metering and monitoring systems, wiring schematic diagrams. Indicate dimensions, capacities, weights and performance characteristics.
- 1.6 DESIGN DATA**
 - .1 Submit samples in accordance with Section 01 33 00 - Submittal Procedures.
 - .2 Submit duplicate samples of equipment and components are to be submitted where requested.
 - .3 After review and acceptance, samples will be returned for incorporation into work.
- 1.7 CLOSEOUT SUBMITTALS**
 - .1 Submit operation and maintenance manuals for incorporation into manual specified in Section 01 78 00 - Closeout Submittals.
 - .2 Include maintenance instructions and list of spare parts and suppliers.
- 1.8 QUALITY ASSURANCE**
 - .1 Supply each type of equipment from a single manufacturer.
- Part 2 PRODUCTS**
 - 2.1 POWER DISTRIBUTION**
 - .1 Service Entrance Board:
 - .1 Rated for 600/347 V, 3 phase, 4 wire.
 - .2 Capacity and short circuit current ratings to suit the specific characteristics of scheduled loads, with allowance for spare capacity as indicated previously.
 - .3 Cubicles: Free standing, dead front with sprinkler hoods.
 - .4 Main Service Entrance: 100% rated moulded case breaker.
 - .5 Feeder Breakers: Moulded case.
 - .6 Utility metering compartment.
 - .2 Transformers:
 - .1 Dry type ANN for indoor applications, Class H insulation and standard taps:
 - .1 BIL high pot standard for pressure rating.
 - .2 Impedance: 170 degrees standard.
 - .2 T-tap transformers are not allowed.
 - .3 Sub-distribution Panels:
 - .1 Suitable for bolt-on breakers only, complete with copper bus bars.
 - .2 Full size neutral bus
 - .3 Main breaker.

- .4 Panelboards:
 - .1 Suitable for bolt-on breakers only, copper or aluminum bus bars.
 - .2 Full size neutral.
 - .3 Main breaker when located greater than 100 meters from source of supply or located in an adjacent building.
 - .4 Recessed when mounted in finished areas.
- .5 Motor Starters and Controls:
 - .1 Manual Starters: Single and Three phase, quick-make, quick-break switching mechanism, one or three overload heaters, manual reset.
 - .2 Full Voltage Magnetic: Magnetic and combination magnetic starters, rapid action contactor and motor overload protective devices in each phase. Equip combination units with circuit breaker and operating lever on the outside.
 - .3 Accessories: Push buttons, selector switches, pilot lights heavy duty oil tight.
 - .4 Electrically held contactors controlled by auxiliary devices: Heavy duty, to EEMAC - ICS-1970, Hands-off-auto illuminated by pilot lights of red, green, white, and ON-OFF. Control relays field convertible.
 - .5 Dedicated terminal strip for field wiring of grouped motor control conductors.
 - .6 Solid state timing relays.

2.2 AUXILIARY POWER

- .1 Leak detection connected to Building Management System for annunciation.
- .2 Transfer switch to switch with minimal interruption in electrical supply and include maintenance bypass.

2.3 GROUND SYSTEM

- .1 Grounding conductors minimum 2/0 copper.
- .2 Electrical bonding conductors sized for fault level and CEC requirements.
- .3 Telecommunications bonding conductors sized as per EIA/TIA recommendations.
- .4 Ground bus:
 - .1 Material: Copper.
 - .2 Size: Minimum 32 mm x 4 mm x 600 mm.
 - .3 Uninsulated in electrical rooms.
 - .4 Insulated in telecom rooms.
- .5 3 m copper clad steel rods.
- .6 Galvanized or polycarbonates inspection cans
- .7 Ground exposed non-current carrying metallic parts of electrical equipment, raceway systems, grounding conductors in non-metallic raceways and neutral conductor of wiring systems to CSA C22.1.

2.4 SURGE PROTECTION

- .1 Line Voltage Surge Suppression:
 - .1 Hard wired, multi-circuit hybrid surge protection device for use at distribution panels.
 - .2 Mode Protection: L-N, L-L normal mode; L-G, N-G common mode.
 - .3 All units must be CSA certified and be certified as UL1449 3rd edition type 2 devices
 - .4 All SPD's shall carry a UL nominal discharge current rating of no less than 20,000A
 - .5 EMI/RFI Attenuation: Maximum 50 dB at 100 kHz.
 - .6 Status Indicators: One per phase and neutral to ground modes (LED) and form C alarm contacts
 - .7 Service entrance locations shall use no less than 250kA per phase surge current rated devices.
 - .8 Sub distribution and computer equipment panelboards shall use no less than 100kA per phase surge current rated devices.

- .2 Communication surge suppression.
 - .1 CCTV:
 - .2 Insertion loss 0.5dB at 40 Mhz
 - .3 132A peak pulse current (10 x 1,000 uSec)
 - .4 Response Time: Maximum 5 nanosecond.
- .3 Ethernet (Cat 5):
 - .1 Insertion loss 0.5dB at 40 Mhz
 - .2 97A peak pulse current (10 x 1,000 uSec)
 - .3 Response Time: Maximum 5 nanosecond.
 - .4 Maximum shunt capacitance <25pF
- .4 Standard of acceptance:
 - .1 Low voltage surge protection device: Eaton SPD series.
 - .2 CCTV: Eaton ECCP series.
 - .3 Ethernet: Eaton EPCH series.

- 2.5 LIGHTNING PROTECTION**
 - .1 Not required.

- 2.6 SERVICE ROOMS**
 - .1 Electrical Service Rooms.
 - .1 No additional requirements.
 - .2 Telecommunication Service Rooms.
 - .1 No additional requirements.

- 2.7 UNDERGROUND SITE SERVICES**
 - .1 Standard of acceptance: Teck, ACWU.

- Part 3 EXECUTION**
- 3.1 INSTALLATION**
 - .1 Install equipment in accordance with manufacturer's instructions.

- 3.2 POWER DISTRIBUTION**
 - .1 Install distribution and sub-distribution electrical equipment in electrical rooms.
 - .2 Install free standing distribution equipment on 100 mm high concrete housekeeping pads.
 - .3 Set and secure switchgear and service entrance equipment in place on channel base, rigid and plumb.
 - .4 Check factory connections in switchgear for mechanical security electrical continuity.
 - .5 Mount dry type transformers on 100 mm high concrete housekeeping pad; ensure adequate clearance for ventilation is available.
 - .6 Install transformers level and upright; loosen isolation pads until no compression is evident.
 - .7 Check trip units, heater settings, fuse sizes, test and commission, energize and set to working condition.
 - .8 Provide plastic laminated full size electrical distribution drawing and permanently mount in main electrical room.

- 3.3 AUXILIARY POWER**
 - .1 Mount transfer switch in main Electrical room.
 - .2 Connect leak detection to Building Management System.

3.4 GROUND SYSTEM

- .1 Install inspection cans flush with surface and locate where protected against vehicle traffic and snow removal equipment.
- .2 Bond electrical equipment to electrical ground bus.
- .3 Bond telecommunication equipment to telecommunication ground bus.

3.5 SURGE PROTECTION

- .1 Bond electrical and telecommunications surge protection to electrical ground system.

3.6 LIGHTNING PROTECTION

- .1 Not required.

3.7 SERVICE ROOMS

- .1 Electrical Service Rooms.
 - .1 No additional requirements.
- .2 Telecommunication Service Rooms.
 - .1 No additional requirements.

3.8 UNDERGROUND SITE SERVICES

- .1 Clean underground raceways before installation of cabling.
- .2 Provide pull card in raceways.
- .3 Solvent weld cap on end of future tenant raceways and identify usage and approximate termination location.

3.9 COMMISSIONING

- .1 Test, commission and set equipment into operation.
- .2 Demonstrate trip settings from coordination study have been applied to adjustable trip devices.
- .3 Demonstrate auxiliary power system can function at rated load for 10 minutes. Operate auxiliary power system for 1/3 of runtime on 50% rated load. Include test parameters in O&M manuals.

END OF SECTION

Part 1

General

1.1

SECTION INCLUDES

- .1 Power Consumption and Rebates
- .2 Raceways.
- .3 Wiring: Service, Feeder and Branch.
- .4 Lighting.
- .5 Site Lighting.
- .6 Lighting Control.
- .7 Emergency lighting.
- .8 Wiring devices.
- .9 Electrical Equipment.
- .10 Wiring methods.

1.2

RELATED SECTIONS

- .1 Division 1
- .2 Section 26 05 01 – Common Requirements – Electrical.
- .3 Section 26 05 02 – Electrical Service and Distribution.
- .4 Section 26 05 04 – Electrical Controls and Instrumentation

1.3

REFERENCES

- .1 American Society of Heating, Refrigeration and Air-Conditioning Engineers/Illuminating Engineering Society of North America. /Illuminating Engineering Society (IES)
 - .1 ASHRAE/IESNA 90.1-2004, Energy Efficient Design of New Buildings Except Low-Rise Residential Buildings.
- .2 Canadian Standards Association (CSA International)
 - .1 CSA C22 No.111-00, General Use Snap Switches (Bi-national Standard, with UL 20).
 - .2 CAN/CSA-G40.20/G40.21-98, General Requirements for Rolled or Welded Structural Quality Steel/Structural Quality Steel.
 - .3 CSA W59-M1989 (R2001), Welded Steel Construction (Metal Arc Welding) (Metric version).
- .3 Illuminating Engineering Society of North America
 - .1 IESNA Lighting Handbook 9th edition.

1.4

DESIGN PERFORMANCE REQUIREMENTS

- .1 Power Consumption and Rebates:
 - .1 All exterior luminaires and the emergency lighting are to be eligible for PowerSmart rebates, where applicable.
 - .2 Lighting power densities are to satisfy ASHRAE/IESNA 90.1-2004.
- .2 Raceways:
 - .1 All power services are to be installed in conduit or by cable
 - .2 All Communication and Security systems are to be installed in:
 - .1 Cable tray:
 - .1 Above finished ceilings.
 - .2 Under raised floor areas.
 - .3 Telecommunication rooms.
 - .2 Raceway:
 - .1 Finished wall spaces.
 - .2 Where exposed.
 - .3 Surface raceways and outlet boxes:
 - .1 Are to be installed in Garage, Workshop Service areas, Electrical rooms, and Telecommunication rooms, raised floor areas.
 - .4 Concealed conduit is to be installed within finished areas.
 - .5 Minimum Conduit Size: 19 mm.

- .6 Install termination fittings approved for the location on cable.
- .3 Wiring: Service, Feeder and Branch.
 - .1 Aluminum NUAL conductors for feeders.
 - .2 Copper conductors for connection to equipment and for branch circuits.
 - .3 Minimum power wiring size #12 AWG.
 - .4 Minimum wire sizes, based on the use of copper conductors:
 - .1 Power and Lighting: No.12 AWG, colour coded conductors.
 - .2 Controls: No.14 AWG.
 - .3 Use RW90 for interior and Teck, ACWU for exterior wiring.
 - .4 Conductors No. 10 and Larger: Stranded.
 - .5 Use Type AC90 armoured cable (BX) for:
 - .1 Connections from conduit to luminaries in accessible ceilings and stud partitions.
 - .2 Servicing devices in stud partition walls from outlet box in ceiling to device location.
- .4 Lighting:
 - .1 As per Plans
- .5 Site Lighting:
 - .1 As per Plans
- .6 Lighting Control.
 - .1 Computerized lighting control.
 - .2 The response of the lighting control system to sensor or occupant controls shall be software configurable and it shall be possible to re-assign a sensor or occupant control.
 - .3 Master controls at Fleet Maintenance main entrance and Shared Amenities, front and back entrances to force the system into the following modes:
 - .1 Cleaning
 - .2 Unoccupied
 - .3 Normal day use
 - .4 Normal night use
 - .4 All entrances to spaces are to have occupant controls.
 - .5 Office areas with direct access to exterior lighting are to have daylight sensors and dim the applicable luminaries in response to available daylight.
 - .6 Intermittent use rooms are to be controlled by motion sensor, such as storage, meeting, training, washrooms, lockers, showers.
 - .7 Garage areas are to have motion sensors which automatically switch illumination from low level to high level. Motion sensors are to be zoned to match an area of 120 sq. m (1200 sq. ft).
 - .8 Minimal usage of interior security lighting. Security lighting shall be of a level to provide effective operation of CCTV cameras.
 - .9 Exterior lighting shall be on/off by photocell.
 - .10 Site lighting shall be low level/high level.
 - .1 Low level shall provide effective operation of CCTV cameras.
 - .2 High level shall be when yard is operational.
 - .3 Switching to high level shall also be possible from Access Control Proximity Card Reader installed at exterior gate entrance.
- .7 Emergency lighting.
 - .1 As part of emergency power for building.
 - .2 Area of coverage:
 - .1 As required by the NBC.
 - .2 Washrooms, lockers, showers and areas where the public (contract staff unfamiliar with the facility) may congregate.
 - .3 Arranged so that failure of one lamp will not leave the area normally illuminated, in darkness.
 - .4 Arranged so that failure of power from a select circuit in areas which provide access to egress will cause Emergency Lighting to illuminate.
 - .5 LED exit signs.

- .3 Provide emergency lighting for auxiliary power in accordance with CAN/ULC emergency power supplies for buildings.
- .4 Self DC battery back-up systems provided in all auxiliary buildings.
- .8 Wiring devices.
 - .1 Receptacles:
 - .1 Each anticipated desk location shall have a minimum of two receptacles, one for computer, and one for general usage.
 - .2 Maximum of 3 computers per 15A computer circuit.
 - .3 Cleaning receptacles shall be provided at 20 meter intervals in circulation spaces.
 - .4 Counter and workbenches shall have general usage receptacles mounted above counter height at 1.2 m average spacing. 20A T-slot GFI receptacle when located adjacent to sinks. 15A or 20A T-slot split wired receptacle otherwise.
 - .5 Each column (if space not free span) shall be provided with a general use receptacle).
 - .6 Telecommunication rooms shall be provided with:
 - .1 Receptacles attached to overhead cable tray, two dedicated receptacles per rack.
 - .2 Two dedicated receptacles on each backboard for wall mounted equipment.
 - .7 Dedicated receptacles for anticipated loads such as coffee machines, microwaves, water coolers, vending machines, network printers, etc. Dedicated circuits when equipment will load circuit to greater than 50% capacity.
 - .8 Exterior GFI receptacles adjacent to each entrance.
 - .9 Employee vehicle parking receptacles shall be IPLC.
 - .10 Parking receptacles for heavy equipment stored in unheated areas or outdoors, connected to IPLC.
 - .11 All receptacles shall be duplex, commercial specification grade.
 - .12 Weatherproof covers for:
 - .1 Exterior receptacles.
 - .2 Wash bay receptacles.
 - .2 For each motorized overhead door wire and connect pushbutton station provided by others
 - .1 Interior of door: UP/DOWN/STOP station.
 - .2 Exterior of door: DOWN/STOP station.
 - .3 Raised floor areas:
 - .1 Not required.
- .9 Electrical Equipment.
 - .1 Provide direct connection for equipment shown on room data sheets which require direct connections.
- .10 Wiring Methods.
 - .1 Provide a dedicated, full size neutral for non-linear load circuits.
 - .2 Lugs, terminals and screws, used for termination of wiring suitable for conductor materials used.
 - .3 Provide independent supports for electrical equipment including fasteners, devices and hangers capable of supporting dead load of equipment and components plus 100 kg. Fibre, wood or plastic inserts are not acceptable.

1.5

QUALITY ASSURANCE

- .1 Utilize design and installation personnel thoroughly familiar with systems of this type.
- .2 Health and Safety:
 - .1 Do construction occupational health and safety in accordance with Manitoba Workplace Safety and Health Requirements.

- .3 COR Certification:
 - .1 All members of the design/build team are to COR Certified to participate in the design, construction and commissioning.

Part 2 PRODUCTS

2.1 POWER CONSUMPTION AND REBATES

- .1 No additional requirements.

2.2 RACEWAYS

- .1 General Areas: EMT with steel set screw connectors.
- .2 Locations subject to mechanical damage: Rigid steel conduits with threaded connections.
- .3 Incoming underground services: Teck, ACWU.

2.3 WIRING, SERVICE, FEEDER AND BRANCH

- .1 Wiring: Service Feeder and Branch, Copper or aluminum for service entrance conductors.
- .2 Copper for branch feeders and circuits. RW90 insulation as standard for interior installations.

2.4 LIGHTING

- .1 CSA labelled, rated for 347 volts.
- .2 Accessories: Mounting hardware, ceiling trim rings and perimeter frames, end closure plates or gaskets, fittings to ensure fixture closure, for secure, accurate and a flush fit installation.
- .3 Luminaries:
 - .1 As per Plans

2.5 WIRING DEVICES

- .1 Duplex receptacles:
 - .1 CSA type 5-15R, 125V, 15A, U ground, for No. 10 AWG wire for side wiring.
 - .2 High impact resistive nylon top face T-type triple wiper or four point double wiper, heavy-duty power contacts extending full length of blades.
 - .3 Colour: White
 - .4 Standard of acceptance: Leviton 5262-W series.
- .2 Switches:
 - .1 To CSA C22.2 No 111, 120-277 VAC, 15A, to accept No. 10 AWG wire.
 - .2 Colour: White.
 - .3 Standard of acceptance: Leviton 1201-2W, 1221-2W, 3031-2W series.
- .3 Cover Plates:
 - .1 Wiring Device:
 - .1 Flush Mounted Outlets: Vertically brushed stainless steel, 1.0 mm thick.
 - .2 Surface Mounted Wiring Devices: Sheet steel.
 - .2 Devices Mounted in FS or FD Conduit Box: Sheet steel.
 - .3 Weatherproof: Cast aluminum, double lift, spring-loaded, with weather-tight gaskets.

2.6 ELECTRICAL EQUIPMENT

- .1 Hand dryers:
 - .1 Quiet operation.
 - .2 Designed to dry hands in under 20 seconds.
 - .3 Standard of acceptance: Nova.
- .2 Hair dryers:
 - .1 Similar configuration to hand dryers. Cast metal case.
 - .2 Quiet operation.

- .3 Minimum 3000 W.
- .4 Standard of acceptance: Nova.

2.7 WIRING METHODS

- .1 Provide a separate insulated bonding wire in conduit.

Part 3 EXECUTION

3.1 INSTALLATION

- .1 Install electrical devices and equipment in accordance with City of Winnipeg Accessible Design requirements.

3.2 POWER CONSUMPTION AND REBATES

- .1 Apply for Manitoba Hydro PowerSmart rebates on behalf of the City of Winnipeg. Turn rebates over to the City of Winnipeg. Include PowerSmart documentation in O&M manuals.

3.3 RACEWAYS

- .1 Run exposed conduit parallel to building lines, and maintain maximum headroom.
- .2 Run conduit within flanged portion of structural steel members.
- .3 Group conduit wherever possible, on channels.
- .4 Provide EMT raceways with steel couplings and set screw connectors for all interior raceways:
- .5 Surface Conduit:
 - .1 Run parallel or perpendicular to building lines with smooth radius bends.
 - .2 Locate conduit behind infrared or gas fired heaters, with 1500 mm clearance.
 - .3 Run conduit within flanged space portion of structural steel.
 - .4 Group conduit wherever possible, on surface channels.
 - .5 Do not pass conduit through structural members, except as indicated.
 - .6 Do not locate conduit less than 75 mm when parallel to steam or hot water piping, with a minimum space of 25 mm at crossovers.
- .6 Flexible Conduit:
 - .1 Dry locations: Flexible metal conduit.
 - .2 Damp or corrosive locations:
 - .1 Liquid tight, flexible metal conduit.
 - .3 Maximum Flexible Conduit Length: 500 mm.
- .7 Surface Mount Conduit:
 - .1 In areas not subject to potential mechanical injury or damage.
 - .2 Only in shop, storage or wash bay areas, subject to the above.
- .8 Conceal Conduit:
 - .1 In all areas.
 - .2 Except in mechanical and electrical service rooms.
 - .3 Except in unfinished areas.
- .9 Wet and Hazardous Locations: Provide heavy wall, rigid, threaded, galvanized steel conduit, Teck or ACWU.
- .10 Corrosive Areas:
 - .1 Use epoxy coated conduit, Teck or ACWU.
- .11 Install high-test fish cord in empty conduit for pulling wire conductors.
- .12 Steel Conduit Bending:
 - .1 Manual bending below 19 mm diameter:
 - .2 Mechanically bend conduit 35 mm diameter and above.
- .13 Conduit up to Ceiling Space from Each Flush Panel:
 - .1 Run two 25 mm spare conduit up from panel.
 - .2 Terminate conduit in space above ceiling, into junction boxes.
- .14 Do not install concealed conduit:
 - .1 In horizontal runs within masonry walls.

- .15 Locate conduit passing through cast-in-place concrete, to clear and to suit reinforcing steel:
 - .1 Install perpendicular to top of slab.
 - .2 Protect from damage where conduit stubs out of concrete.
 - .3 Install sleeves where they stub through slab or wall.
 - .4 Provide oversized sleeves where conduit passes through waterproof membrane.
 - .1 Install before membrane.
 - .2 Use sealable non-setting mastic between sleeve and conduit.
 - .5 Encase conduit completely in concrete.
 - .16 Slope underground conduit to provide natural drainage to an accessible location.
Waterproof conduit joints with heavy coat of bituminous paint or coating.
 - .17 Use steel set screw connectors for EMT. Use threaded fittings for rigid steel conduit
 - .18 Suspend individual cable or conduit runs with 6 mm diameter threaded rods and spring clips.
 - .1 Support two or more cable or conduit on channels supported by 6 mm diameter threaded rod hangars, where direct fastening to substrate construction is impractical.
 - .19 Use U shaped channels, 40 x 40 x 2.5 mm thick, spaced at 3000 mm on centre for surface mounting of two or more conduit.
 - .20 Ensure adequate support for raceways and cable where dropped vertically to equipment, where there is no substrate support.
 - .21 Do not use wire lashing or perforated strap to support or secure raceways or cable.
- 3.4 WIRING: SERVICE FEEDER AND BRANCH**
- .1 Install in accordance with manufacturers recommendations.
- 3.5 LIGHTNING**
- .1 Install in accordance with manufacturers recommendations.
 - .2 Orientate luminaries with building lines.
- 3.6 SITE LIGHTING**
- .1 Aim luminaries in accordance with manufacturers aiming diagram.
 - .2 Allow for re-aiming of 25% of luminaries to provide additional illumination in areas as directed by the City of Winnipeg.
- 3.7 LIGHTING CONTROL**
- .1 Program system for local control, time clock control and master control.
- 3.8 EMERGENCY LIGHTING**
- .1 Measure illumination level at night.
 - .2 Include results in O&M manual.
- 3.9 WIRING DEVICES**
- .1 Do not install outlets back to back in same wall or partition.
 - .1 Provide minimum 150 mm horizontal separation between boxes.
 - .2 Locate light switches on latch side of doors.
 - .3 Locate disconnect devices on latch side of door.
- 3.10 ELECTRICAL EQUIPMENT**
- .1 Mount hair dryers at manufacturers recommended height.

3.11 WIRING METHODS

- .1 Install lighting fixtures, outlets, plates and other visible items parallel to building lines. Line up exposed raceways, parallel and at right angles to building walls, partitions, and ceilings.
- .2 Install cable drops for luminaires of sufficient length to allow the luminaire to be relocated to any location within a 3000 mm radius.
- .3 Clamp cable before entering the luminaire and clip cable before entering the conduit system junction box.
- .4 Secure equipment to be placed on concrete, glazed tile and plaster/gypsum board surfaces using expansion screws.
- .5 Secure equipment to hollow walls using toggle bolts.
- .6 Secure surface mounted equipment:
 - .1 .To suspended tee-bar ceilings using twist clip fasteners.
 - .2 Ensure that tee-bars are adequately supported to carry weight of equipment plus 50% safety factor, before installation.
- .7 Support equipment conduit or cable using clips, spring-loaded bolts, and cable clamps designed as accessories to basic channel members.
- .8 Do not use supports or equipment installed for other purposes for conduit or cable support.
- .9 Install fastenings and supports as required for each type of equipment cable and conduit, in accordance with manufacturers' installation instructions.

3.12 COMMISSIONING

- .1 Test, verify and put Work of this Section into full operation.
- .2 Provide necessary maintenance personnel training.

END OF SECTION

-
- Part 1** **PART 1 - GENERAL**
- 1.1** **SECTION INCLUDES**
- .1 Customer Metering
 - .2 Motor Control
- 1.2** **RELATED SECTIONS**
- .1 Division 1
 - .2 Section 26 05 01 – Common Electrical Requirements.
 - .3 Section 26 05 02 – Electrical Service and Distribution.
 - .4 Section 26 05 03 – Lighting, Power and Branch Wiring.
- 1.3** **STANDARDS**
- .1 Canadian Standards Association CSA International
 - .2 CSA C22.1-02, Canadian Electrical Code.
 - .3 NEMA - National Electrical Manufacturers Association.
- 1.4** **DESIGN PERFORMANCE REQUIREMENTS**
- .1 Motor Control.
 - .2 No additional requirements.
- 1.5** **QUALITY ASSURANCE**
- .1 Utilize design and installation personnel thoroughly familiar with systems of this type.
 - .2 Health and Safety: Do construction occupational health and safety in accordance with Manitoba Workplace Safety and Health requirements.
 - .3 COR Certification:
 - .4 All members of the design/build team are to be COR Certified to participate in the design, construction or commissioning.
- Part 2** **PRODUCTS**
- 2.1** **MOTOR CONTROL**
- .1 Local control for motors to be individual starters, grouped starters.
 - .2 Provide each unit with Hands-off-auto control with remote capability for system control by building management system.
 - .3 Control Relays: 5 amp, normally open, normally closed contacts, volt coils.
 - .4 Switches: Heavy duty standard or water tight as required by the area of service.
 - .5 Indicating lights.
 - .6 Provide group control capability, to operate grouped equipment simultaneously.
- Part 3** **PART 3 - EXECUTION**
- 3.1** **INSTALLATION**
- .1 Connect communications equipment to manufacturers' recommendations.
- 3.2** **MOTOR CONTROL**
- .1 No additional requirements.
- 3.3** **COMMISSIONING**
- .1 Test, verify and put Work of this Section into full operation.
 - .2 Provide necessary maintenance personnel training.

END OF SECTION

Part 1 PART 1 - GENERAL

1.1 SECTION INCLUDES

- .1 Clock System.
- .2 Voice and Data Systems.
- .3 Public Address Systems.
- .4 Intercom System.
- .5 Cable Television System.
- .6 Audio Visual System.

1.2 1.2 RELATED SECTIONS

- .1 Division 1.
- .2 Section 26 05 01 – Common Requirements – Electrical.

1.3 REFERENCES

- .1 American National Standards Institute (ANSI)
 - .1 ANSI/ICEA S-83-596, Fibre Optic Premises Distribution Cable.
 - .2 ANSI/ICEA S-90-661-2002, Category 3, 5 & 5e Individually Unshielded Twisted Pair Indoor Cable for Use in General Purpose and LAN Communication Wiring Systems.
 - .3 ANSI/J-STD-607A, Commercial Building Grounding (Earthing) and Bonding Requirements for Telecommunications.
 - .4 ANSI/TIA/EIA-455-107A Return Loss for Fibre Optic Components.
 - .5 ANSI/TIA/EIA-455-220A Minimum Bandwidth: Laser Effective Modal Bandwidth.
 - .6 ANSI/TIA/EIA-568-C.0, Generic Telecommunications Cabling for Customer Premises.
 - .7 ANSI/TIA/EIA-568-C.1, Commercial Building Telecommunications Cabling Standard – Part 1: General Requirements.
 - .8 ANSI/TIA/EIA-568-C.3, Optical Fibre Cabling Components Standard.
 - .9 ANSI/TIA/EIA-598-B, Optical Fibre Cable Color Coding.
 - .10 ANSI/TIA/EIA-606-A, Administration Standard for Commercial Telecommunications Infrastructure.

1.4 DESIGN PERFORMANCE REQUIREMEN

- .1 Clock System:
 - .1 120V powered digital LED clocks to be provided as directed by the City of Winnipeg.
- .2 Voice and Data System:
 - .1 Voice System
 - .1 The City of Winnipeg Intends to utilize a Centrax Telephone System provided by MTS.
 - .2 Install a system of copper cabling to MTS requirement.
 - .3 Horizontal cabling from telecommunication room to outlet Cat-5e minimum.
 - .4 Each telephone outlet shall have the capacity for two lines.
 - .5 System of Copper Trunk Cabling from telephone patch field to Telephone Utility Demarcation point.
 - .6 Size trunk cabling for 50% spare capacity.
 - .7 Size backbone cabling interconnecting sub-telecom room for 50% spare capacity, minimum 50 pair.
 - .8 Provide patch cords to allow patching of telephone system.
 - .9 Coordinate with Contract Administrator for outlets which require greater than two lines.
 - .2 Data System
 - .1 System of Cat-6 horizontal cabling terminated on patch panels in telecommunication room(s).

- .2 System of fibre optic cabling linking Main Telecom room to Sub-telecom room, terminated in fibre patch panels.
- .3 Provide 12 spare fibers in each fibre cable linking telecom rooms.
- .4 Terminate all installed fibre strands on patch panels.
- .3 Racking
 - .1 Size racking to accommodate Contract Administrator's active equipment.
- .4 Raised Floor areas
 - .1 Provide a telecommunication consolidation point on 6m x 6m grid.
 - .2 Size consolidation point for 100% spare capacity of voice and data requirements.
 - .3 Minimum of two consolidation points per raised floor room.
- .5 Maximum 40% conduit fill.
- .6 Maximum 90 meters from data outlet to termination in telecommunication room.
- .3 Public Address System
 - .1 Not required.
- .4 Intercom System
 - .1 Weatherproof Calling stations shall be located at Building Main Entrance, Building Rear Entrance, and each Entry Card Reader Pedestal at motorized sliding gates.
 - .2 Locate Master station (head end) in telecommunication room.
 - .3 Provide Remote stations which can receive and respond to calls at:
 - .1 Reception.
 - .2 Streets foreman.
 - .3 Parks foreman.
 - .4 Bridge foreman.
 - .5 Fleet foreman.
 - .4 Master and Remote stations are to annunciate calling station.
 - .5 Each remote station shall have the capability to open card access controlled doors/gates associated with (located adjacent to) each calling station. This capability shall be enabled by card reader adjacent to each remote station for one open cycle only. Each open request via the intercom station pushbutton shall require a card read to identify the person utilizing the intercom station pushbutton.
 - .6 The reception area shall have the capability to enable/disable all other remote intercom stations (reception unattended) so that while the reception is occupied, intercom calls are only sent to the reception remote intercom station. The systems time schedule shall automatically switch the system between unattended mode and attended modes during normal business hours. Visual annunciation on whether a station is enabled is to be provided at each intercom station.
- .5 Cable Television System
 - .1 No design inputs.
- .6 Audio Visual System
 - .1 Audio Visual Equipment will be provided and installed by the City of Winnipeg.
 - .2 Provide all equipment mounts, power outlets, telecommunication raceways and interconnecting cabling to enable the City to install and connect the equipment.

1.5 SHOP DRAWINGS

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

1.6 DESIGN DATA

- .1 Submit design data in accordance with Section 01 33 00 – Submittal Procedures.

1.7 MAINTENANCE DATA

- .1 Provide operations and maintenance data for incorporation into manual specified in Section 01 78 00 - Closeout Submittals. Include the following:
 - .1 Maintenance instructions.
 - .2 List of components.
 - .3 Operation and maintenance instructions.

- .4 List of spare parts and supplies.
- .5 List of devices address identification.

1.8 QUALITY ASSURANCE

- .1 Utilize design and installation of personnel thoroughly familiar with systems of this type.
- .2 Health and Safety:
 - .1 Do construction occupational health and safety in accordance with Manitoba Workplace Safety and Health Requirements.
- .3 COR Certification:
 - .1 All members of the design/build team are to be COR Certified to participate in the design, construction and commissioning.

Part 2 PART 2 - PRODUCTS

2.1 SUSTAINABLE REQUIREMENTS

- .1 Use only low emitting adhesives, caulking, paint, coatings, and sealants to meet LEED® Credits 4.1 and 4.2 under Indoor Environmental Quality: Low Emitting Materials.

2.2 CLOCK SYSTEM

- .1 Battery powered clocks.
- .2 LED Read out.

2.3 VOICE AND DATA SYSTEMS

- .1 Two 100 mm rigid PVC service entrance raceways extended to underside of service entrance backboard.
- .2 Four post 19" equipment rack with vertical and horizontal cable management..
- .3 Cat 5 and Cat 6 patch panels and patch cords.
- .4 Fibre optic patch panels with cable management tray.
- .5 50/125 mm OM3 multi-mode fibre optic cable.
- .6 Duplex SC connectors.
- .7 RJ45 IDC connectors – blue for telephone, white for data.
- .8 Patch cords of varying length – adequate numbers for patching of installed cables.
- .9 Under raised floor telecommunication consolidation point.

2.4 PUBLIC ADDRESS SYSTEM

- .1 Not required.

2.5 INTERCOM SYSTEM

- .1 Standard of acceptance: Aiphone Industrial intercom system.

2.6 CABLE TELEVISION SYSTEM

- .1 RG7 & RG59 cabling system.
- .2 System of couplers, amplifiers, splitters and taps.

Part 3 PART 3 - EXECUTION

3.1 INSTALLATION

- .1 Install telecommunication cabling telecommunication raceway system consisting of either conduit, cable tray or J hooks. Free running of cabling is not allowed.
- .2 Make communication terminations in accordance with manufacturers' recommendations.
- .3 Ensure adequate clearances are maintained between power and communication systems wiring.
- .4 Bond telecommunication raceway system using separate system of bonding.

-
- .5 Provide telecommunication connections for equipment shown on the room data sheets or in the program of requirements, whether Design Build Team provided or Contract Administrator provided.
- 3.2 CLOCK SYSTEM**
- .1 Install in accordance with manufacturer's recommendations.
- 3.3 VOICE AND DATA SYSTEM**
- .1 Provide a minimum of two (2) telecommunications rooms for building. Locate as close as practical to centre of area served.
 - .2 Install and label horizontal cabling, trunk cabling and backbone cabling.
 - .3 Install equipment rack and cable management.
 - .4 Terminate horizontal cabling on RJ95 outlets at patch panel and outlet.
 - .5 Terminate fibre backbone cable.
 - .6 Terminate trunk cable(s) at patch panel and at IDC connectors. Bridge to telephone utility IDC's.
 - .7 Bond to telecommunication grounding system.
- 3.4 PUBLIC ADDRESS SYSTEM**
- .1 Not required.
- 3.5 INTERCOM SYSTEM**
- .1 Locate paging stations which receive and respond to calls in locations as directed by the Contract Administrator.
 - .2 Install motorized sliding gate calling stations adjacent to card reader in pedestal.
- 3.6 3CABLE TELEVISION SYSTEM**
- .1 No additional requirements.
- 3.7 AUDIO VISUAL SYSTEM**
- .1 Install power outlets, raceways and telecommunication cabling c/w connections.
 - .2 Install ceiling outlets flush with the underside of ceiling.
- 3.8 COMMISSIONING**
- .1 Test, verify, and put into operation systems specified in this section, and necessary training.
 - .2 Test and commission systems, provide test and verification reports, and put into operation.
 - .3 Master Slave/Clock System
 - .1 Automatically regulates indicating clocks and program devices using master time clock; correct clocks on a 12 hour or similar basis.
 - .4 Voice Data System
 - .1 Test and document copper cabling in accordance with TIA/EIA standards.
 - .2 Test fibre optic cabling using OTDR.
 - .3 Include testing results in O&M manual.
 - .5 Public Address System:
 - .1 Not required.
 - .6 Intercom System:
 - .1 Demonstrate function and clarity of system.

END OF SECTION

Part 1 PART 1 - GENERAL**1.1 SECTION INCLUDES**

- .1 Fire Alarm Detection System.
- .2 Access Control and Intrusion Detection.
- .3 Closed Circuit Television Systems.

1.2 RELATED SECTIONS

- .1 Division 1.
- .2 Section 26 05 01 – Common Requirements – Electrical.
- .3 Section 27 05 13 – Communications Systems.

1.3 REFERENCES

- .1 Underwriters' Laboratories of Canada (ULC)
 - .1 CAN/ULC-S524-06, "Installation of Fire Alarm Systems".
 - .2 CAN/ULC-S537, Verification of Fire Alarm Systems.

1.4 DESIGN PERFORMANCE REQUIREMENTS

- .1 Fire Alarm System:
 - .1 In addition to NBC and CAN/ULC-S524 requirements provide the following:
 - .1 Fire detectors.
 - .1 In all areas not protected by sprinklers.
 - .2 Smoke detectors.
 - .1 In telecommunication rooms.
 - .2 Both sides of fire smoke shutters.
 - .3 Heat detectors.
 - .1 In storage rooms.
 - .2 In electrical rooms.
 - .4 Signal devices.
 - .1 Strobe coverage in workshop areas.
 - .2 Strobe coverage in areas as dictated by the City of Winnipeg's accessible design requirements.
 - .5 Annunciators:
 - .1 Front entrance.
 - .2 Rear entrance.
 - .3 One additional location as directed by the Contract Administrator.
 - .6 Isolation modules installed at boundaries between each of the major areas.
 - .1 Wash.
 - .2 Streets maintenance.
 - .3 Bridge.
 - .4 Shared office (main level and second level)
 - .5 East area parks
 - .6 Centralized parks
 - .7 Future Fleet Management.
 - .2 Initiation loops configured in DCLA.
 - .3 Alarm, supervisory and trouble are to be annunciated at the City of Winnipeg Central Monitoring Location via the Building Automation System by dry contact. In addition, all field devices are to annunciate at the Central Monitoring Station via the Building Automation System using a network connection between the Fire alarm System and Building Automation System
 - .4 Logging: Automatically log all system events for future review. Log change of status, alarm and fault messages, with time of day and date.
 - .5 Provide addressable, microprocessor based, zoned, non-coded, electrically supervised, single stage, and general evacuation type of fire alarm system with data communication link. Provide remote annunciators.

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- .6 Sprinkler System: Fully zoned and supervised by fire alarm system, and indicate sprinkler flow, tamper condition, pressure loss, as a minimum.
- .7 Deleted as per addendum #2
- .8 Fire Hose Cabinets: Electrically monitored to signal trouble or tamper conditions.
- .9 Provide alarm indication by sounding horns and operating strobe lights for visual indication in buildings designed for barrier free access.
- .10 Annunciated at City of Winnipeg's Central Monitoring facility.
This would only be accomplished via the interfacing with the Honeywell system and providing we install a front end at City or interface via BacNet to the Metasys system.
- .11 Annunciated on Building Automation System.
This again would be per comment in .10 above
- .12 Provide modular design to permit minimum 25% future expansion.
- .13 Do not load each circuit to more than 80% capacity.
- .14 Provide 2 spares of each Fire Alarm System device to be stored in an enclosure mounted beside the main Fire Alarm System panel and utilizing the same lock/key mechanism. Storage enclosure to be labeled as "Fire Alarm Spare Parts Cabinet".
- .15 Provide Class A wiring loops. Utilizing zone isolators (i.e. idnet with quad isolators in Fire alarm System panel and field isolators).
- .16 Provide one set each of Form C dry alarm contacts for common system alarm, trouble and supervisory.
- .2 Access Control and Intrusion Detection:
 - .1 Refer also to City of Winnipeg Access Control and Intrusion Detection requirements, located in Appendix C6. Equipment installed will be per drawings.
 - .2 Access Control by Proximity Card Reader shall be provided at:
 - .1 The motorized sliding gates via long range card readers and also at the man gates located at the motorized sliding gates. The man gate will have the standard 8" read range reader.
 - .2 The front and rear main entrances will have non-mullion mounted readers with the standard 8" read range, providing the mounting surface is non-metallic.
 - .3 Intrusion detection at security perimeters as indicated on the plans.
 - .4 At telecommunication rooms.
 - .5 Adjacent to each Intercom Remote station. These card readers shall enable the Intercom remote Station to open a door/gate associated with the calling station for one open cycle. Only the Access Control point associated with the calling station which initiated the call shall be able to be opened via the integration with Commend and Pro-Watch from the 5 listed locations in the next point.
 - .3 Access Control by remote Push Button station shall be provided for each motorized sliding gate and associated man gate at:
 - .1 Locate where directed by Contract Administrator.
 - .2 Provide Push Button remote stations in:
 - .1 Reception.
 - .2 Streets foreman.
 - .3 Parks foreman.
 - .4 Bridge foreman.
 - .5 Fleet foreman.
 - .4 Arming and Disarming of select components of the Access Control
 - .1 OH Doors will be allowed control when the intrusion system is disable and uncontrolled if system is armed. NO card readers will be required for enabling or disabling use of OH doors, unless noted otherwise on the plans.
 - .2 Overhead doors in street maintenance will have exterior card readers to enable the door control during unarmed operation
 - .3 Two card readers will be provided for the entry lanes to control the gates. One medium range reader for cars at the low level and one for long range

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- reader at the high level for large trucks or one long rang reader coverage is acceptable for both applications.
- .4 Card access control will be supplied for the exit lane.
- .5 Card Readers provided per the plans.
- .6 The system time schedule, which will automatically arm and disarm select components and/or security partitions.
- .7 City of Winnipeg Central Monitoring Station.
- .8 Arming and disarming will be possible from central monitoring from eith Pro-Watch station or integration into the Metasys system.
- .9 Card reader for arming and disarming will be provided as indicated on the plans.
- .10 Program specialized cards which will provide a valid read on the above card readers. The City of Winnipeg may elect to assign privileges as an alternative to specialized cards.
- .11 The above card readers shall visually annunciate their status (override/normal)
- .5 Intrusion Detection shall be provided for the entire building perimeter
 - .1 Doors by door contact
 - .1 Overhead doors by door contact
 - .2 Windows accessible from the ground by motion detectors
 - .3 Roof hatches and doors by door contacts
 - .2 Interior corridors by motion detectors as indicated on plans.
- .6 Arming and disarming of the Intrusion Detection system shall be by:
 - .1 Card Readers on the interior of the main entrances.
 - .2 Card Readers as indicated on plans
 - .3 The system time schedule, which will automatically arm and disarm select intrusion detection zones.
 - .4 From the City of Winnipeg's Central Monitoring facility.
 - .5 Arming and disarming will be possible from central monitoring from either Pro-Watch station or integration into the Metasys system.
 - .6 Provide status display adjacent to each of these Card readers to annunciate the status of the facilities Intrusion Detection zones
- .7 Arming and disarming of select components of the Intrusion Detection system shall be provided by:
 - .1 Card Readers at interior security partitions.
 - .2 The system Time Schedule, which will automatically arm and disarm the associated partitions.
 - .3 From the city of Winnipeg's Central Monitoring facility
 - .4 Proximity Card Readers located on the exterior adjacent to each Street Maintenance . This reader will enable the open button during disarmed hours with during a valid access. The down/stop pushbutton will always remain operational. See plans for applicable overhead doors.
- .8 Electric strikes shall be used as the standard means of securing Personal doors.
- .9 Annunciate the open/closed status of each motorized gate at 5 locations
- .10 Each Access Control and Intrusion Detection point shall be annunciated at City of Winnipeg Central Monitoring facility via the Building Automation system. Card readers associated with an Access Control point (door or gate) or an Intrusion Detection perimeter shall visually annunciate that they have been disabled from a remote Card Readers/System Time Schedule/ Central Monitoring Station of 28 13 00.1.4.2.4 or 28 13 00.1.4.2.6 or 28 13 00.1.4.2.7 Annunciation will be via a workstation at Central or on Metasys system once interfaced.
- .11 All card readers shall be provided with a lamacoid label indicating their function unless the Card reader provides access control to a door/gate immediately adjacent to it.
- .3 Closed Circuit Television System
 - .1 Definitions:

99% REVIEW

- .1 General View PTZ: CCTV camera which provides a wide angle general view of an area using PTZ style cameras.
- .2 General View Fixed: General type view with fixed CCTV camera.
- .3 Identification View PTZ: CCTV camera which provides a view capable of identifying people or vehicle number plates. The subjects face shall occupy 50% of the field of view in an identification view. PTZ style cameras.
- .4 Identification View Fixed: Identification type view with fixed CCTV camera.
- .5 PTZ cameras shall not be used as a primary source of CCTV coverage and when not being manually controlled shall be programmed to return to a stationary, home position. When a PTZ camera is in this home position it shall be considered to be providing coverage equivalent to a fixed camera.
- .2 Provide CCTV system, to provide visual surveillance of designated areas (see plans for all locations):
 - .1 All yard areas, by both General View Fixed and General View PTZ cameras. Complete coverage shall be provided by a minimum of three General View Fixed and one General View PTZ.

All exterior cameras being provided are PTZ for the exception of the pedestal cameras to view vehicle users. See plans for placement.
 - .2 Marshalling area, provide a minimum of three identification View PTZ cameras to provide detailed coverage. Home position shall be a general view, with zoom capabilities to provide an identification view. These cameras are in addition to the cameras required for coverage of the yard area.

See plans for placement.
 - .3 Interior public spaces, general view, fixed.
 - .4 Front and rear reception/waiting areas, General View PTZ.
 - .5 Main corridors in shared amenities space, Identification View Fixed.
 - .6 Workshop areas tool and material storage areas: General View PTZ.
 - .7 Lunch/Multipurpose room, two General View Fixed.
 - .8 General View PTZ at ten other locations as selected by the City of Winnipeg.
 - .9 At vehicles entering the site at motorized sliding gates, General View fixed.
 - .10 At vehicles leaving the site at motorized sliding gates, General View Fixed.
 - .11 Mount on motorized sliding gate entrance pedestals, identification view PTZ of vehicle driver.
- .3 Provide cameras, video monitors, recorders and controls to enable security personnel to determine movement and identification-capable at an ambient light level of 1.5 FC. CCTV Network Switches, when required will be provided by the City of Winnipeg.
- .4 All cameras to be IP based and transmit in high definition.
- .5 Video storage shall record video from all cameras for a period of 31 days (one month).
- .6 Provide Operating Station to view live video, manually control cameras and manually switch between cameras at:
 - .1 Reception.
 - .2 Streets foreman.
 - .3 Parks foreman.
 - .4 Bridge foreman.
 - .5 Fleet foreman.

- .7 The Contract Administrator will select a location for investigation station to review recorded images.
- .8 CCTV system network equipment will be provided by the City of Winnipeg Corporate IT department.
- .9 The IP cameras will be on the security backbone, network equipment will have ability to be patched on corporate network.
- .10 Network equipment not located inside a telecommunication room shall be installed inside enclosures with the appropriate environmental sealing and shall include heating and ventilation as required.
- .11 Develop maps showing the coverage of all cameras and obtain approval from the City of Winnipeg. The approved coverage shall then be reflected in the software setup.

1.5 SHOP DRAWINGS

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

1.6 TEST REPORTS

- .1 Submit test and verification reports from approved independent testing laboratories certifying compliance with specifications.

1.7 MAINTENANCE DATA

- .1 Provide operations and maintenance data for incorporation into manual specified in Section 01 78 00 - Closeout Submittals. Include the following:
 - .1 Maintenance instructions.
 - .2 List of components.
 - .3 Operation and maintenance instructions.
 - .4 List of spare parts and supplies.
 - .5 List of devices address identification.

1.8 QUALITY ASSURANCE

- .1 Utilize design and installation personnel thoroughly familiar with systems of this type.
- .2 Health and Safety:
 - .1 Do construction occupational health and safety in accordance with Manitoba Workplace Safety and Health Requirements.
- .3 COR Certification:
 - .1 All members of the design/build team are to be COR Certified to participate in the design, construction and commissioning.

Part 2 PART 2 - PRODUCTS

2.1 FIRE ALARM SYSTEM

- .1 Acceptable manufacturers: Siemens, GE (Edwards), Notifier, Simplex Grinnell model 4100ES addressable system.
- .2 Intelligent smoke detector with detection signature configurable for installed location.
- .3 The Fire Alarm System panel is to include a minimum of 6 Fire Alarm signaling circuits.
- .4 The system is to have a secondary CUP to ensure constant system operation during programming or software downloading.
- .5 Each display is to have a minimum 8 line event LCD display, both in Fire Alarm Control Panel and remote annunciators. The Fire Alarm Control Panel is to include individual zone LED's & bypass switches (i.e. for first responders), programmed as advised by the Contract Administrator. Include in the FACP one spare card (8 zone LED & bypass switches).
- .6 The remote annunciator panels are to include plexi glass covering to protect the panel circuit boards.
- .7 All strobes shall be multi-candela and be synchronized.

2.2 ACCESS CONTROL AND INTRUSION DETECTION

- .1 Refer also to City of Winnipeg Product requirements, located in Appendix C6. Access Control System to be Pro-Watch integrated with MaxPro VMS.
- .2 Card readers suitable for Manitoba Environment.
- .3 Poly carbonate enclosures and galvanized pedestals at Motorized Sliding.
- .4 On card readers which arm/disarm select components, armed/disarmed status of security partition/component shall be annunciated.
- .5 Electromagnetic Locking Hardware standard of acceptance:
 - .1 Personal Doors, Electric Strike: Rutherford Controls 2114/2314 series.
 - .2 Personal Doors, Magnetic Lock: Rutherford Controls 8310-IQ-LSS.
 - .3 Gates: Rutherford Controls 8380-RLS.
- .6 Motorized Sliding Gate remote manual pushbutton stations:
 - .1 Open pushbutton for each gate.
 - .2 Close pushbutton for each gate.
 - .3 Visually annunciate each gates open, in-transit or closed status.
 - .4 Lock Open pushbuttons to lock each pair of entrance/exit gates in the open position. Push to lock open, push to return to normal operation. Locking a gate in the open position via this pushbutton shall generate an alarm on the access control system, with the intent that the instigator shall clear the alarm via contact with the City of Winnipeg Central Monitoring Location.
 - .5 Visually annunciate the locked open status of gate pair.
 - .6 Remotely resettable to normal operation from the City of Winnipeg's Central Monitoring Station.
- .7 .7 Man Gate at motorized sliding gate manual pushbutton:
 - .8 .1 Provide pushbutton to manually open each man gate at motorized sliding gate.
 - .9 .2 Locate within Motorized Sliding Gate remote manual pushbutton station.

2.3 CLOSED CIRCUIT TELEVISION SYSTEM

- .1 The CCTV system shall utilize Panasonic iPRO or equal components. Equipment shall be provided by an integrator who services equipment in Canada and who will maintain the installation warranty.
 - .1 Cameras:
 - .2 High Definition 720p data stream.
 - .3 Low light capable.
 - .4 High contrast compensation.
 - .5 Motion detection and Audio detection recording trigger, selectable.
 - .6 Fixed body camera: Panasonic iPro WV-NP502 with WV-LZA62/2 lenses or equal. When installed outdoors shall use environmental housing P0H1500HB.or equal
 - .7 Dome Camera: Panasonic iPro WV-NW502S or equal, to be installed in the locations where a camera may be subject to vandalism, such as over doors for identification views or at the motorized gate pedestals or equal
 - .8 PTZ Camera: Panasonic iPro WV-SW395.
- .2 Digital Video Recorder:
 - .1 On screen menu to allow selection of camera recording.
 - .2 Ability to transfer selected segment of recording to external DVD.
 - .3 Ability to tag selected segments and archive in DVR memory.
 - .4 Network video recorder shall be Panasonic iPro or equal WJ-ND400 or equal. Associated expansion HDD shall be WJ-HDE400 or equal.
- .3 Operating Stations:
 - .1 five 21" LCD monitors.
 - .2 One monitor for full screen view, one monitor user configured for one, flour or sixteen cameras.
 - .3 Camera controller.
- .4 Investigation Station:
 - .1 Two 21" LCD monitors.

- .2 One monitor for live view of selected camera.
- .3 One monitor for playback of selected recording.
- .4 DVR and Camera controllers.

Part 3 PART 3 - EXECUTION

3.1 INSTALLATION

- .1 Locate control equipment, panels, and security terminations in closets as designated and connect to 110 VAC power source.
- .2 Locate devices as indicated on layout drawings, make connections to system wiring.
- .3 Locate and install fire detectors in accordance with standard, do not mount detectors within 1 m of supply air outlets.
- .4 Install systems wiring in EMT conduit, in exposed areas unless specified otherwise. Utilize j-hooks or cable trays where ever practical.
- .5 Install CCTV cameras, wire and align to suit user requirements look of fixed lens cameras.
- .6 Ensure adequate clearances are maintained between power and communication systems wiring.

3.2 FIRE ALARM SYSTEM

- .1 Locate main fire alarm panel in telecommunication room
- .2 Wire circuits for alarm, trouble, and signals for proper alarm system operation from addressable components.
- .3 Separate raceways for each leg of loop, separated by 10 metre minimum.
- .4 Connect system to central monitoring agency. Confirm manufacturer and connectivity.
- .5 Label panels, control equipment and wiring.
- .6 Manufacturer to conduct two inspections during first year operation. Submit written report to Design Build Team Engineer for each inspection.
- .7 Provide one (1) free re-burn to incorporate all temporary program changes during construction.
- .8 As-built drawings are to show: Diagrams of all loops in block diagram format; Floor plans are to show the routing of the loops and the location of all Fire alarm System devices, including the address associated with each field device.
- .9 Provide lamacoid label on each EOLN cover plate or utilize specially manufactured EOLN plate provided by Fire Alarm manufacturer to visually identify EOLN's. EOLN's are to be indicated on as-built drawing
- .10 Provide hard copies and copies burned to CD of the Verification report. This is to also include a complete Fire Alarm System device list with addresses. Locate one hard/CD copy of the Verification report at the Fire Alarm Control Panel. Remaining hard/CD copies are to be placed in the O&M Manuals.
- .11 Provide Fire Alarm System device address on the base of each field device using a label marker. Permanent ink marker is not acceptable.
- .12 Wire size minimum: #12 AWG for power wiring; #18 AWG twisted shielded c/w ground wire for data & addressable loop wiring.

3.3 ACCESS CONTROL AND INTRUSION DETECTION

- .1 Mount control panels in telecommunication rooms.
- .2 All Access Control and Intrusion points are to be annunciated on Building Automation System for transmission to City of Winnipeg Central Monitoring location.
- .3 This can be accomplished providing interfacing to Metasys is done Otherwise separate workstation to be provided at Central.
- .4 Update the City of Winnipeg's Central Monitoring Station to incorporate this site.
- .5 Configure the system so that each major user can restrict access to users of their areas. Propose draft access rights to the Contract Administrator for approval, incorporate revisions and implement.
- .6 Refer also to City of Winnipeg Execution requirements, located in Appendix C6.

- .7 Mount long range card readers on back pans which allow equipment to attain specified read range.
- .8 Mount motorized sliding gate Card Reader Pedestal so that card can be presented by vehicle driver, or intercom can be operated, without leaving vehicle.
- .9 Provide lamacoid adjacent to arm/disarm keypads or card readers indicating security perimeter or component that is armed/disarmed.

3.4 **CLOSED CIRCUIT TELEVISION SYSTEM**

- .1 All camera mounts are to be commercially available and provide a steady platform free from vibration
- .2 Exterior camera mounts shall remain free from vibration during winds less than 50km/h
- .3 If a camera cannot be connected into the CCTV network copper cabling due to distance limitations, fibre cable with switches shall be utilized
- .4 Cameras not mounted on the main building are to be connected into the CCTV network by fibre optic cabling.
- .5 Exterior luminaries mounted on the high mast luminaries' pole shall be mounted on the lowering structure to allow their servicing from ground level.
- .6 Configure each Operating Station to receive views as advised by the Contract Administrator.
- .7 Document camera views in O&M manuals via screen capture.

3.5 **COMMISSIONING**

- .1 Test, verify, and put into operation systems specified in this section, and necessary training.
- .2 Test and commission systems, provide test and verification reports, and put into operation.
- .3 Fire Alarm System:
 - .1 Operating System: Commissioned by system manufacturer/supplier.
 - .2 Verify performance to CAN/ULC-S537.
 - .3 Measure dBA audio intensity throughout facility in all rooms and document in O&M manuals.
 - .4 Training:
 - .1 Manufacturer to provide on-site training and demonstrations, to train operational personnel in use and maintenance of fire alarm system, including operations and minor troubleshooting. Train for a minimum of two (2) days.
 - .2 Orient training to installed system, not a general training course.
 - .3 Contract Administrator retains the right to reject instructors based on their qualifications.
 - .4 Provide a training manual for each trainee, describing in detail, data included in each training program.
 - .5 Provide all equipment and materials required for classroom training.
- .4 Intrusion Alarm System
 - .1 Refer to Commissioning requirements, located in Appendix C6, provided by City of Winnipeg.
- .5 Closed Circuit Television System
 - .1 Demonstrate correct functioning of all Cameras under both day and night conditions.
 - .2 Demonstrate recording and retrieval of camera images.
 - .3 Demonstrate tagging of segments for archiving.

END OF SECTION

Part 1 General

1.1 SUMMARY

- .1 This Section covers performance requirements for mitigation of potential post-construction gas accumulations associated with the former Elmwood/Nairn Avenue Landfill.
- .2 This Section also covers the excavation, trenching, disposal of excess or unsuitable excavated material, shoring, foundations, bedding, backfilling and compaction required for the installation of Underground Works.
- .3 This Section also covers the excavation, disposal of surplus excavated material, shoring, and backfilling and compaction required for the construction of buildings and structures.

1.2 CITY SPECIFICATIONS, RELATED SECTIONS AND REFERENCES

- .1 City of Winnipeg Standard Construction Specifications:
 - .1 CW 1120 – Existing Service, Utilities and Structures
 - .2 CW 1130 – Site Requirements
 - .3 CW 2030 – Excavation Bedding and Backfill
 - .4 CW 3110 – Sub Grade, Sub Base and Base Course Construction
 - .5 CW 3235 – Renewal of Existing Miscellaneous Concrete Slabs
 - .6 CW 3240 – Renewal of Existing Curbs
- .2 Related Sections:
 - .1 Section 01 33 00 – Submittal Procedures
 - .2 Section 01 74 19 – Construction Waste Management and Disposal
 - .3 Section 31 32 19.01 – Geotextiles
 - .4 Section 33 11 16 – Site Water Utility Distribution Piping
 - .5 Section 33 31 13 – Public Sanitary Utility Sewerage Piping
 - .6 Section 33 41 00 – Storm Utility Drainage Piping
 - .7 Section G1010 – Site Clearing
- .3 City of Winnipeg Standards and Guidelines for the Mitigation of Methane Gas at Buildings and Utilities and Guidelines for Construction on Landfill Sites.

1.3 PERFORMANCE REQUIREMENTS

- .1 Examine geotechnical reports and information located in Appendix A: *Background Information*:
 - .1 City of Winnipeg – letter report dated February 7, 2011, *Public Works East Yards – Geotechnical Investigation*, prepared by AECOM.
 - .2 *Former Elmwood / Nairn Avenue Landfill Site Final Preliminary Site Condition Assessment Report* as prepared by KGS Group.
 - .3 Drawing 01-C-1002 titled: *Summary Diagram of Subsurface Investigations*, prepared by AECOM
- .2 Site work shall be performed in accordance with CW 1130 – Site Requirements.
- .3 Coordinate work in accordance with:
 - .1 City of Winnipeg Standards and Guidelines for the Mitigation of Methane Gas at Buildings and Utilities and Guidelines for Construction on Landfill Sites.
- .4 Excavation and trenching shall be performed in accordance with CW 2030 – Excavation Bedding and Backfill.
- .5 Avoid accumulation of methane gas within underground utilities, trenches, under buildings and structures, and excavations, which are potential conduits for gas migration.
 - .1 Ensure open void utilities (e.g. sewers, culverts, communication conduits, etc.) are constructed of an appropriate material, and in a manner which ensures air and water tightness.
 - .2 Provide passive utility trench venting in strategic locations, extending from the bedding and initial backfill to (600 mm typ.) above the ground surface, allowing potential methane gas accumulations to escape to the atmosphere.

- .3 Avoid conflict between vent placement and other site surface features.
- .6 Where trenches or excavations cross the property line:
 - .1 Construct a trench plug of low permeability material (compacted clay, bentonite, shrinkage compensating grout, or equivalent) as shown on the Drawings.
 - .2 Ensure that the trench plug transects vertically and horizontally through the granular material underlying and/or surrounding the excavation and utility.

- 1.4 SUBMITTALS**
 - .1 Coordination of Submittals: Shall be made in accordance with Section 01 33 00 - Submittal Procedures.
 - .2 Prior to beginning excavation submit for approval by the Owners Advocate, plans, drawings and documentation in support of:
 - .1 Handling procedures for subsurface debris encountered during the course of excavation and trenching activities.

- 1.5 QUALITY ASSURANCE**
 - .1 Sustainable Requirements:
 - .1 Contractor shall perform work in accordance with:
 - .1 Section 01 74 19 – Construction Waste Management and Disposal.

- Part 2 Products**
 - 2.1 MATERIALS**
 - .1 Materials and Products: in accordance with CW 2030 – Excavation Bedding and Backfilling and CW 3110 – Sub Grade, Sub Base and Base Course Construction.
 - .2 Geotextiles: as per Section 31 32 19.01 - Geotextiles.

- Part 3 Excavation**
 - 3.1 EXCAVATION**
 - .1 Perform excavating, trenching, and backfilling activities in accordance with CW 2030 – Excavation Bedding and Backfill and CW 3110 – Sub-Grade, Sub-Base and Base Course Construction.

 - 3.2 FILL TYPES AND COMPACTION**
 - .1 Use types of fill and compact as indicated or specified in CW 2030 – Excavation Bedding and Backfill, and CW 3110 – Sub-Grade, Sub-Base and Base Course Construction.
 - .2 Install geotextiles in accordance with Section 31 32 19.01 - Geotextiles.

 - 3.3 BEDDING AND SURROUND OF UNDERGROUND SERVICES**
 - .1 Place and compact granular material for bedding and surround of underground services as specified in CW 2030 – Excavation Bedding and Backfill.
 - .2 New and existing utilities running across trenches and excavations shall have measures put in place to mitigate the potential for methane gas migration within the backfilled trench or excavation.

END OF SECTION

Part 1 General

1.1 DESCRIPTION

- .1 This Section outlines requirements for the application of herbicides for weed control, brush control, stump control and soil sterilization.

1.2 RELATED SECTIONS

- .1 Related sections include:
 - .1 Section 32 92 19_16 - Hydraulic Seeding.
 - .2 Section 32 92 23 - Sodding
 - .3 Section 32 92 10 - Trees, Shrubs and Ground Cover Plantings

1.3 REFERENCES

- .1 Department of Justice:
 - .1 Pest Control Products Act, RS, 1985, c. P-9 (current to March 3, 2006).
- .2 Health Canada: (HC)/Pest Management Regulatory Agency (PMRA) National Standard for Pesticide Education, Training and Certification in Canada (1995).

1.4 PERFORMANCE REQUIREMENTS

- .1 For weed control in turf areas, achieve within 30 days of treatment, minimum of 90% kill of target plants without damaging grasses.
- .2 For soil sterilization, achieve within three (3) months of treatment, 100% kill of vegetation.

1.5 SUBMITTALS

- .1 Make submittals in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Data Sheets and Reports:
 - .1 Submit manufacturer's instructions, including printed product literature, specifications and datasheet.
 - .2 Submit two copies of Workplace Hazardous Materials Information System (WHMIS) - Material Safety Data Sheets (MSDS) in accordance with Section 02 81 01 - Hazardous Materials.
 - .1 WHMIS acceptable to Human Resources Development Canada - Labour and Health Canada for herbicides and pesticides.
 - .2 Indicate VOC content.
 - .3 Provide copy of on-site stored products to local fire department.
- .3 Quality Control Reports: within 7 days of work completion, submit written report containing following information:
 - .1 Full name and PCP Registration number of herbicide products used including adjuvants.
 - .2 Copies of Provincial Applicator's License and Pesticide Project Application Permit.
 - .3 Copy of equipment log indicating spray calibration used during pesticide application.

1.6 QUALITY ASSURANCE

- .1 Quality Assurance: in accordance with Section 01 45 00 - Quality Control.
- .2 Safety Requirements:
 - .1 Comply with label directions on the use of herbicide products.
 - .2 Comply with applicable personnel safety standards for handling and use of pesticides.

- .3 Regulatory Requirements:
 - .1 Pesticide Certification Programs: comply with National Standard for Pesticide Education, Training and Certification, and Provincial, and local pesticide control regulations of locality in which operation is to be carried out.
 - .2 Obtain permits and licenses necessary to complete work.

1.7 DELIVERY, STORAGE AND HANDLING

- .1 Deliver, store and handle materials in accordance with Section 01 61 00 - Common Product Requirements.
- .2 Deliver, store and maintain packaged materials with manufacturer's seals and labels intact.
- .3 Provide storage facility with non-porous floor capable of preventing leaching of spilled pesticides.
- .4 Prevent damage, adulteration and soiling of material during delivery, handling and storage.
- .5 Store material in accordance with label directions, including those on maximum and minimum storage temperatures.
- .6 Store herbicide products in original containers as supplied by manufacturer and keep sealed until used.
- .7 Store herbicide products in sheltered, well ventilated, controlled access location.
- .8 Do not store herbicides near feeds and food stuffs, agricultural plants, seeds, fungicides, insecticides, fertilizers or other agricultural chemicals.
- .9 Identify storage building as pesticide storage facility for fire protection purposes.
- .10 Prominently post:
 - .1 List of medical and fire department telephone numbers.
 - .2 Locate list of products stored outside of storage building, and keep list up-to-date.

1.8 WASTE MANAGEMENT AND DISPOSAL

- .1 Separate waste materials for reuse and recycling in accordance with Section 01 74 19 - Construction Waste Management and Disposal.
- .2 Triple jet rinse empty herbicide containers with diluents and add rinsate to spray mixture in tank.
- .3 Puncture and crush triple rinsed containers making them unsuitable for further use and dispose of material at appropriate recycling drop point.
- .4 Crush paper and cardboard containers and dispose of material at appropriate recycling facility.
- .5 Dispose of containers in accordance with provincial requirements.
- .6 Do not rinse or wash spray tanks and equipment on site.
- .7 Dispose of wash water from spray tanks and equipment in non-crop, non-graze area away from water sources including wells and ponds.
- .8 Dispose of unwanted or contaminated pesticides through appropriate environmental management facilities that will dispose of pesticide in accordance with Pest Control Products Act.
- .9 Dispose of water soluble packaging (usually PVA - poly vinyl acetate) in accordance with manufacturer's instructions in sprayer tank. All safety precautions for handling and use of PVA packaging must be adhered to.
 - .1 Adhere to safety precautions for handling and use of PVA packaging.
- .10 Place materials defined as hazardous or toxic waste in designated containers.
- .11 Ensure emptied containers are sealed and stored safely for disposal away from children.

Part 2 Products

2.1 MATERIALS

- .1 Herbicides:
 - .1 Select appropriate herbicides to achieve specified control requirement.
 - .2 Herbicide products used must be currently registered for such in accordance with Pest Control Products Act.
- .2 Adjuvants: compatible with herbicide product used.
 - .1 Choose adjuvants with lowest toxicity levels and residual effects.

2.2 EQUIPMENT

- .1 Tank Sprayer: do not use air-blast, mist or fog sprayer.
 - .1 Set pressure setting at minimal functional level to minimize spray drift.
 - .2 Provide with adjustable height boom, hose and handgun for spot treatments, strainers and nozzles to produce spray pattern compatible with job.
 - .3 Equip tank continuous agitation device.
 - .4 Ensure pressure gauge and regulator capable of maintaining uniform pressure between 100 and 450 kPa.
 - .5 Ensure equipment operated on turf has low pressure, wide profile turf tires.
- .2 Backpack Sprayer:
 - .1 With hose and handgun for spot treatment.
- .3 Dry formulation applicator:
 - .1 Drop type capable of calibration.
 - .2 Ensure equipment operated on turf has low pressure, wide profile turf tires.
- .4 Equip spray tank loading pipe with check valve located within one metre of pump or hydrant to prevent siphoning from spray tank resulting in contamination of water source.

Part 3 Execution

3.1 NOTICE OF SPRAY OPERATION

- .1 Post areas to be treated with signs placed at each road access and 100 m intervals around perimeter.
- .2 Indicate on signs that spray program is being implemented.
- .3 Put signs in place prior to beginning of spray operation and retain in place for 24 hours after spray operation is completed.

3.2 ENVIRONMENTAL PROTECTION

- .1 Application may continue only when wind velocities range between 2 and 10 km/h.
- .2 Do not spray when air turbulence will prevent uniform application.
- .3 Do not apply herbicides or pesticides within 100 m of wells, rivers, streams, lakes, marshes or other environmentally sensitive areas unless otherwise sanctioned by provincial permit.
 - .1 Eliminate areas of steep grade from targeted areas as precipitation can facilitate leaching to non targeted areas before degradation of the chemical has occurred.
- .4 In case of herbicide or pesticide spill, notify Departmental Representative and Manitoba Conservation verbally immediately and subsequently in writing.

- .1 Minor spill: use dry soil or other absorbent materials to remove excess liquid and sweep up powders or granular material.
- .2 Spread contaminated soils or sweepings over large area of bare soil to facilitate degradation.
- .3 Dispose of paper, cardboard or paper packaging contaminated during spill as dictated by Manitoba Conservation.
- .5 Do not allow drifting beyond target area.
 - .1 Use mechanical method to minimize herbicide drift.
- .6 Do not apply sterilants to slopes greater than 3 to 1 where killing vegetation would lead to erosion.
- .7 Mix concentrate and water at least 50 m away from any water supply.

3.3 APPLICATION OF HERBICIDES

- .1 Application's instructions: comply with manufacturer's written recommendations or specifications, including product technical bulletins, handling, storage and installation instructions, and datasheet.
- .2 Calibrate equipment to achieve manufacturer's recommended application rates.
- .3 Confine herbicide application to areas indicated to achieve specified control requirements.
- .4 Space successive passes to provide uniform coverage of treated area.
- .5 Apply spray at full leaf stage of plant growth and thoroughly wet foliage to point of runoff in accordance with label directions.
- .6 Where roots of desirable vegetation run under treatment area, use contact herbicides.
- .7 Ensure formulation and use rate of sterilant will not lead to leaching outside treatment area.
- .8 Re-treat areas in accordance with label directions until specified control requirements are achieved.
- .9 Use appropriate buffer zones and berms to avoid surface contamination of wells, ponds and streams.

3.4 CLEANING

- .1 Proceed in accordance with Section 01 74 11 - Cleaning.
- .2 On completion and verification of performance of installation, remove surplus materials, excess materials, rubbish, tools and equipment.

END OF SECTION

Part 1 General

1.1 LEAD REQUIREMENTS

- .1 Review this Section 01 47 15 – LEED Requirements and comply with all LEED requirements.

1.2 WASTE MANAGEMENT AND DISPOSAL

- .1 Separate waste materials for reuse and recycling in accordance with Section 01 74 19 - Construction/Demolition Waste Management and Disposal.

Part 2 Products

2.1 MATERIALS

- .1 Materials to conform to *The City of Winnipeg Standard Construction Specification CW 3330 – Installation of Interlocking Paving Stones*.
- .2 The contractor shall be responsible for the supply, sake storage and handling of all materials set forth in this Section.
- .3 Precast Concrete Unit Paving: ‘Madrid’ antique brown Pavers manufactured by Barkman Concrete Ltd., Winnipeg, MB. Pavers shall conform to ASTM C902. Size: 8-1/4” x 4-1/8” x 2” height.
- .4 Bedding Sand: shall be fine aggregate as specified in *The City of Winnipeg Standard Construction Specification CW 3330*.
- .5 Joint Sand: shall be fine aggregate as specified in *The City of Winnipeg Standard Construction Specification CW 3330*.
- .6 ‘Snap Edge’ commercial grade restraint, 1 7/8”.

Part 3 Execution

3.1 LAYOUT OF WORK

- .1 Accurately lay out paving Work to patterns and conditions shown on Drawings and verify with the Construction Manager prior to construction.
- .2 Provide additional control points and stakeouts as required to effect correct alignments and grade elevations.
- .3 Advise the Construction Manager of discrepancies and on-site conditions detrimental to critical layouts and obtain approved correction.

3.2 PREPERATION OF SAND BASE

- .1 Sand base shall be installed in accordance with *The City of Winnipeg Standard Construction Specification CW 3330*.

3.3 IN STALLATION OF PRECAST CONCRETE PAVERS

- .1 Unit pavers shall be installed in accordance with the requirements of *City of Winnipeg Specification CW 3330*, set in locations and patterns as shown on the Drawings. Spaces between joints shall not exceed 3mm, and shall be uniform and consistent while maintaining true patterns as indicated on the Drawings.
- .2 ‘Snap Edge’ commercial grade restraint shall be installed as per manufacturers specifications.
- .3 If cutting of pavers is required, the sawn edges shall be true, even and undamaged. Cuts shall occur at the end of rows and intersections of lines of paving only.
- .4 Unit pavers shall be compacted into the bedding sand layer using approved vibratory compactors until they are at the proper grade, uniformly level and free of any movement.
- .5 Joint sand shall be swept into joints until full.

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3.4 CLEANING

- .1 Remove excess sand and cutting debris with broom and dispose of in accordance with Section 01 74 19 – Construction / Demolition / Waste Management Plan.

3.5 PROTECTION

- .1 Protect pavers from damage resulting from subsequent construction operations.
- .2 Remove protection materials upon Substantial Performance of Work, or when risk of damage is no longer present.

END OF SECTION

Part 1 General

1.1 DESCRIPTION

- .1 This Section outlines requirements for topsoil, topsoil amendments, and growing medium, as well as the stripping of topsoil, should viable topsoil exist on site; the preparation of existing grades, placing of topsoil and finish grading.

1.2 SITE MATERIAL

- .1 Ensure that suitability and usefulness of on-site material is checked and verified by a certified professional or Soil Testing Laboratory.

1.3 REFERENCES AND RELATED SECTIONS

- .1 City of Winnipeg Standard Construction Specifications:
 .1 CW 3170 – Earthwork and Grading
 .2 CW 3520 - Seeding
 .3 CW 3540 – Topsoil and Finish Grading
 .2 Related Sections
 .1 Section 31 32 19_01 – Geotextiles
 .2 Section 32 92 16 - Hydraulic Seeding
 .3 Section 32 92 23 - Sodding
 .4 Section 32 93 10 - Trees Shrubs and Ground Cover Plantings
 .5 Section G1030 - Site Earthwork

1.4 REFERENCES

- .1 CW 3540 Topsoil and Finish Grading for Establishment of Turf Areas.

1.5 SUBMITTALS

- .1 Provide submittals in accordance with Section 01 33 00 - Submittal Procedures.
 .2 Submit Erosion and Sedimentation Control Plan in accordance with Section 01 47 13 LEED Requirements.
 .3 Quality control submittals:
 .1 Soil testing: submit certified test reports showing compliance with specified performance characteristics and physical properties.
 .2 Certificates: submit product certificates signed by manufacturer certifying materials comply with specified performance characteristics and criteria and physical requirements.

Part 2 Products

2.1 TOPSOIL

- .1 Topsoil for areas to receive Grass Seed Mixtures: shall be either stockpiled site soil or imported topsoil, as per CW 3540.
 .2 Soil Mixture for planting beds and tree pits: mixture 45% topsoil with 35% peat moss, 15% sandy loam and 5% manure by volume.

2.2 GROWING MEDIUM

- .1 Peat moss and sand constituents of Growing Medium for areas to receive Rough Seed Mixture: as per CW 3540.
 .2 Compost shall be *unrestricted grade*: includes yard, agricultural and silvicultural wastes plus untreated wood products that have been treated by pathogen-free requirement procedures (PFRP), which is, maintained at 131°F (55°C) for 48 to 96 hours. To ensure that the compost is free of disease-causing organisms.

2.3 SOIL AMENDMENTS

- .1 Contractor is responsible for amendments to supply topsoil as specified.
- .2 Soil testing by recognized testing facility for PH, P and K, and organic matter.

2.4 MULCH

- .1 Mulch in stormwater infiltration swale shall be clean river run stone, 20mm to 30mm.

Part 3 Execution**3.1 TEMPORARY EROSION AND SEDIMENTATION CONTROL**

- .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 and walkways, according to sediment and erosion control plan, specific to site, that complies with EPA 832/R-92-005 or requirements of authorities having jurisdiction, whichever is more stringent.
- .2 Inspect, repair, and maintain erosion and sedimentation control measures during construction until permanent vegetation has been established.
- .3 Remove erosion and sedimentation controls and restore and stabilize areas disturbed during removal.

3.2 STRIPPING OF TOPSOIL

- .1 As per CW 3540
- .2 Strip topsoil to depths as determined by localized soil depth and chemistry testing.

3.3 PREPARATION OF EXISTING GRADE

- .1 Prepare existing grade in accordance with Section G1030 – Site Earthwork.

3.4 PLACING AND SPREADING OF TOPSOIL/PLANTING SOIL

- .1 Place and spread topsoil in accordance with CW 3540.
- .2 For sod areas: spread topsoil to a minimum depth after settlement of 75 mm.
- .3 For seeded areas: spread topsoil to a minimum depth after settlement of 100 mm.
- .4 For planting beds: spread planting soil mixture to a minimum depth after settlement of 450 mm.
- .5 For linear upland buffer planting beds: spread planting soil mixture to a minimum depth after settlement of 300mm.
- .6 For stormwater infiltration swale spread minimum of 500 mm of compacted depth prepared engineered soil.
- .7 Manually spread topsoil/planting soil around trees, shrubs and obstacles.

3.5 SOIL AMENDMENTS

- .1 For sod and seeded grass areas: apply and thoroughly mix soil amendments as recommended by soil test results into top 50mm of existing soil:
- .2 For planting beds and stormwater infiltration swale: apply and thoroughly mix soil amendments as recommended by soil test results into full specified depth of soil mixture.

3.6 GROWING MEDIUM

- .1 For areas to receive Rough Seed Mixture: mix 35 mm peat moss and 15 mm sand into the top 75 mm of clean clay cover, following construction of rough grades.

3.7 STORMWATER INFILTRATION SWALE

- .1 Engineered soil for stormwater infiltration swale shall include a mixture of 20% topsoil, 50% sand and 30% compost
- .2 Gravel under drain blanket: for the entire width of the infiltration swale shall extend 300 mm from minimum the 200 mm perforated sub-drain discharge pipe connected to the on-site stormwater system.
- .3 Filter fabric: shall be installed between prepared planting medium and gravel under drain blanket.
- .4 Install river-run stone to 50mm depth by hand around planting.

3.8 FINISH GRADING

- .1 Finish grading as per CW 3540.

3.9 ACCEPTANCE

- .1 Test topsoil for NPK to determine fertilizer requirements and application rates.
- .2 Provide additional test results for planting soil mixtures if so directed by the Contract Administrator.

3.10 SURPLUS MATERIAL

- .1 Dispose of materials, except imported topsoil not required, off site.

3.11 CLEANING

- .1 Proceed in accordance with Section 01 74 11 – Cleaning.

END OF SECTION

Part 1 General

1.1 DESCRIPTION

- .1 This Section outlines requirements for hydraulic seeding including seed, mulch, slurry preparation and application, and maintenance.

1.2 RELATED SECTIONS

- .1 Section 31 31 19.13 - Chemical Control of Vegetation.
 .2 Section 32 91 19.13 - Topsoil Placement and Grading.
 .3 Section G1030 - Site Earthwork

1.3 SUBMITTALS

- .1 Submit product data in accordance with Section 01 33 00 - Submittal Procedures, for seed mix, mulch, tackifier and fertilizer

1.4 SCHEDULING

- .1 Schedule hydraulic seeding to coincide with preparation of soil surface, between dates recommended by the Provincial Agricultural Department for seeding grasses and legumes.

1.5 WASTE MANAGEMENT DISPOSAL

- .1 Divert unused fertilizer from landfill to official hazardous material collections site.
 .2 Do not dispose of unused fertilizer into sewer systems, lakes, streams, onto ground or in locations where it will pose health or environmental hazard.

Part 2 Products

2.1 MATERIALS

- .1 Flood/Salt Tolerant Seed mixture:
 .1 25% Western wheatgrass / *Agropyron smithii* 'Flintlock'
 .2 15% Canada wild rye / *Elymus canadensis*
 .3 40% Switchgrass / *Panicum virgatum*
 .4 10% Fowl Bluegrass / *Poa palustris*
 .5 10% Nuttall's alkali grass / *Puccinellia nuttalliana*
 .2 Resilient Tall Grass mixture:
 .1 10% Northern Wheatgrass / *Agropyron dasystachyum*
 .2 15% Awned Wheatgrass / *Agropyron smithii*
 .3 30% Fringed Bromegrass / *Bromus ciliatus*
 .4 1% Ticklegrass / *Agrostis scabra*
 .5 7% Rough Fescue / *Festuca scabrella*
 .6 10% Perennial Ryegrass / *Lolium perenne*
 .7 15% Annual Ryegrass / *Lolium multiflorum*
 .8 5% Nuttall's Alkali Grass / *Puccinellia nuttalliana*
 .9 5% Sheep's Fescue / *Festuca ovina*
 .10 2% Junegrass / *Koeleria cristata*
 .3 Rough Seed mixture: "Canada No. 1" in accordance with Government of Canada "Seeds Act" and "Seeds Regulations".
 .1 Mixture composition:
 .1 Birdsfoot trefoil 35%.
 .2 White Clover 25%.
 .3 Perennial ryegrass 15% cultivars as per CW 3520 Section 5.3.4.
 .4 Creeping Red fescue 25%

- .2 or alternate seed mix comprising two or more hardy native legumes and two or more hardy native grass species appropriate to site conditions.
 - .4 Mulch, Tackifier and Water: as per CW 3520.
 - .5 Fertilizer:
 - .1 To Canada "Fertilizers Act" and "Fertilizers Regulations.
 - .2 Complete synthetic, slow release fertilizer with 35% of nitrogen content in water-insoluble form.
- Part 3 Execution**
- 3.1 WORKMANSHIP**
- .1 As per CW 3520.
- 3.2 PREPARATION OF SURFACES**
- .1 As per Section 32 92 20 - Topsoil and Finish Grading.
 - .2 Cultivate areas to receive the Rough Seed Mixture to a depth of 75 mm.
 - .3 Mix 35 mm of peat moss and 15 mm sand with clean clay base.
 - .4 Ensure areas to be seeded are moist to depth of 100 mm before seeding.
- 3.3 FERTILIZING PROGRAM**
- .1 As per Section 31 92 20.
- 3.4 PREPARATION AND APPLICATION OF SLURRY**
- .1 As per CW 3520.
- 3.5 MAINTENANCE DURING ESTABLISHMENT PERIOD**
- .1 As per CW 3520.
 - .2 For legume and grass seed mixtures intended for periodic mowing, only.
 - .1 Mow legume mixtures to 100 mm when height reaches 200 mm and as follows:
 - .1 Do not mow within period commencing 3 weeks before and ending 3 weeks after first severe, average fall frost date and 3 weeks after actual severe fall frost.
 - .2 When mowing after first severe fall frost, mow at a height of not less than 300 mm.
 - .3 Remove clippings which will smother plants.
 - .3 Water all seeded areas during establishment period to maintain optimum soil moisture level for germination and continued growth. Control watering to prevent washouts.
- 3.6 ACCEPTANCE**
- .1 As per CW 3520.
 - .2 Flood/Salt Tolerant Seed mixture seeded into sod will be accepted when the area has a healthy growing stand of a good variety of the seeded species.
- 3.7 MAINTENANCE DURING WARRANTY PERIOD**
- .1 Perform following operations from time of acceptance until end of warranty period:
 - .1 Repair and reseed dead or bare spots.

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.2 Mow areas seeded, remove clippings, in accordance with following schedule:

Seed Mixture	Frequency Requirements for Cutting	Height of Cut
Flood/Salt Tolerant Seed Mixture	Monthly	100 mm
Resilient Tall Grass Mixture	Bi-weekly	100mm
Roughseed Mixture	Periodically when height reaches 200 mm	150mm
		100mm

.2 Fertilize seeded areas as per Section 31 92 20.

3.8

CLEANING

.1 As per CW 3520.

END OF SECTION

Part 1 General

1.1 DESCRIPTION

- .1 This Section outlines requirements for sod type, placement, preparation and maintenance.

1.2 REFERENCES AND RELATED SECTIONS

- .1 City of Winnipeg Standard Construction Specifications:
 - .1 CW 3170 – Earthwork and Grading
 - .2 CW 3510 - Sodding
- .2 Related Sections
 - .1 Section 01 33 00 - Submittal Procedures.
 - .2 Section 01 74 19 – Construction Waste Management and Disposal
 - .3 Section 31 31 19.13 – Chemical Control of Vegetation.
 - .4 Section 32 91 19.13 – Topsoil Placement and Grading.
 - .5 Section 31 32 19.01 - Geotextiles

1.3 SUBMITTALS

- .1 Samples.
 - .1 Submit samples in accordance with Section 01 33 00 - Submittal Procedures.

1.4 QUALITY ASSURANCE

- .1 Test Reports: certified sod test reports showing compliance with specified performance characteristics and physical properties.

1.5 SCHEDULING

- .1 In accordance with CW 3510

1.6 MATERIALS

- .1 Turf Grass Sod: as per CW 3510:
Number One Kentucky Bluegrass - Fescue Sod: Nursery Sod grown solely from seed mixture of cultivars of 95% Kentucky Bluegrass (100% Class 2 cultivars, 3 cultivars in equal proportion) and 5% Creeping Red Fescue.
- .2 Sod establishment support: as per CW 3510:
 - .1 Geotextile fabric: biodegradable, square mesh.
 - .2 Wooden pegs: 17 x 8 x 200 mm.
 - .3 Stenlog erosion control system.
- .3 Fertilizer: As per Section 32 91 19.13 - Topsoil Placement and Grading.

1.7 SOURCE QUALITY CONTROL

- .1 Verification of sod, as per Section 01 33 00 - Submittal Procedures.

Part 2

Execution

2.1

PREPARATION

- .1 Topsoil and finish grading as per Section 31 91 19.13 – Topsoil Placement and Grading.

2.2

SOD PLACEMENT

- .1 As per CW 3510

2.3

MAINTENANCE DURING ESTABLISHMENT PERIOD

- .1 As per CW 3510

2.4

ACCEPTANCE

- .1 As per CW 3510

2.5

MAINTENANCE DURING WARRANTY PERIOD

- .1 As per CW 3510
 - .1 Water sod areas at intervals to obtain optimum soil moisture conditions to depth of 100 mm.
 - .2 Repair and re-sod dead or bare spots.
 - .3 Cut grass to a height of 65 mm and remove clippings.
 - .1 Fertilize areas in accordance with a fertilizing program.
 - .2 Eliminate weeds by mechanical or chemical means.
 - .1 If chemical means are used, comply with Section 31 31 19.13 - Chemical Control of Vegetation.

2.6

CLEANING

- .1 Upon completion of installation, remove surplus materials, rubbish, tools and equipment barriers.

END OF SECTION

Part 1 General**1.1 SUMMARY**

- .1 This Section includes: Materials and installation methods for tree, shrub and ground cover plantings; tree support, mulching and maintenance.

1.2 CITY SPECIFICATIONS, RELATED SECTIONS AND REFERENCES

- .1 City of Winnipeg Standard Construction Specifications
 - .1 CW 3170 – Earthwork and Grading
 - .2 CW 3540 – Topsoil and Finish Grading
- .2 Related Sections:
 - .1 Section G1030 – Site Earthwork
 - .2 Section 32 91 19.13 - Topsoil Placement and Grading
 - .3 Section 01 33 00 - Submittal Procedures
 - .4 Section 01 74 19 - Construction Waste Management and Disposal
- .3 City of Winnipeg Forestry Department: Tree Planting and Maintenance Specification (Draft).
- .4 City of Winnipeg By-law No 200/2006: By-law to promote orderly use of land and buildings
 - .1 Part 5: Development and Design Standards Landscaping and Buffering, Preservation of Existing Trees
- .5 Agriculture and Agri-Food Canada (AAFC).
 - .1 Plant Hardiness Zones in Canada-2000.
- .6 Canadian Nursery Landscape Association (CNLA).
 - .1 Canadian Standards for Nursery Stock, 8th edition.
- .7 Canada Green Building Council (CaGBC) LEED® Green Building Rating System – LEED® Canada-NC Version 1.0.

1.3 SUBMITTALS

- .1 Make submittals in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Submit product data for:
 - .1 Fertilizer
 - .2 Anti-desiccant
 - .3 Mulches

1.4 STORAGE AND PROTECTION

- .1 Supply and transport plant material to site.
- .2 Coordinate the shipping of plant material and the excavation of tree pits and planting beds to ensure no more than 24 hours elapse between the plant material arriving on site and being installed.
 - .1 Protect plant materials against abrasion, exposure and extreme temperature change during transit.
- .3 Protect foliage and root balls using anti-desiccants and tarpaulins, where use of enclosed vehicle is impractical.

1.5 WARRANTY

- .1 Warrant plant material as itemized on all Plant Lists, to remain free of defects for two (2) years.

1.6 DAMAGE CONTROL

- .1 Take every precaution not to damage, injure or mark any existing structures or landscaping on the street right-of-way or adjacent properties.
- .2 Should any damage be caused by the Contractor, his/her employees or equipment, restore or replace to the satisfaction of the Contract Administrator. This applies even if damage results from work done in the process of correcting deficiencies.

Part 2 Products

2.1 SUSTAINABLE REQUIREMENTS

- .1 Materials and products in accordance with Section 01 47 19 - Sustainable Requirements: Verification.

2.2 PLANT MATERIAL

- .1 Trees shall be of the species and sizes noted on the Plant Specification List:
- .2 All Nursery Stock supplied shall be from Canadian prairie nursery root or seed stock. Quality in accordance with the latest *Guide Specification for Nursery Stock* of the Canadian Nursery Trades Association.
- .3 Nomenclature of specified Nursery Stock should conform to the International Code of Nomenclature for Cultivated Plants and in accordance with the approved scientific names given in the latest edition of standardized Plant Names.

2.3 PLANTING SOIL

- .1 Shall be as per Section 32 91 19.13 - Topsoil Placement and Grading.

2.4 WATER

- .1 Provide water free of impurities that would inhibit plant growth, including: oils, acids, alkalis, salts and other substances.
- .2 Further to clause 3.7 of CW 1120-R1, the Contractor shall pay for all costs associated with obtaining water in accordance with the City of Winnipeg Waterworks By-law. Sewer charges will not be assessed for water obtained from a City hydrant.

2.5 STAKES AND GUYS

- .1 Shall be as per Tree Planting Detail and Shrub Planting Detail on Drawing L-1.

2.6 TRUNK PROTECTION

- .1 Shall be as per Tree Planting Detail and Shrub Planting Detail on Drawing L-1.

2.7 MULCH

- .1 Wood chips or varying in size from 50 mm to 75 mm and 5 to 20 mm thick, free of bark, small branches and leaves.
- .2 Mulch in stormwater infiltration swale shall be clean river run stone, 20mm to 30mm.

2.8 FERTILIZER

- .1 N-P-K as recommended by soil test report.

2.9 ANTI-DESICCANT

- .1 Wax-like emulsion.

2.10 FLAGGING TAPE
 .1 Fluorescent colour.

2.11 SOURCE QUALITY CONTROL
 .1 Imported plant material shall be accompanied with necessary permits and import licenses. Conform to Federal, Provincial or Territorial regulations.

Part 3 Execution

3.1 PRE-PLANTING PREPARATION

- .1 Remove damaged roots and branches from plant material.
- .2 Apply anti-desiccants to conifers and deciduous trees in leaf, in accordance with manufacturer's instructions.

3.2 EXCAVATION AND PREPARATION OF PLANTING BEDS

- .1 Establishment of sub-grade for planting beds: shall be as specified in Section G1030 – Site Earthwork.
- .2 Preparation of planting beds: shall be as specified in Section 32 91 19.13 - Topsoil Placement and Grading.
- .3 For individual planting holes:
 - .1 Stake out location and confirm prior to excavating.
 - .2 Excavate to depth and width as indicated on Planting Details on Drawing 01-C-1003.
 - .3 Remove subsoil, rocks, roots, debris and toxic material from excavated material that will be used as planting soil for trees and individual shrubs. Dispose of excess material.
 - .4 Scarify sides of planting hole.
 - .5 Remove water which enters excavations prior to planting.

3.3 PLANTING

- .1 Plant trees and shrubs in accordance with the planting details.
- .2 Plant vertically in locations as indicated. Orient plant material to give best appearance in relation to structure, roads and walks.

3.4 TRUNK PROTECTION

- .1 Install trunk protection on deciduous trees prior to installation of tree supports.

3.5 TREE SUPPORTS

- .1 Use single stake tree support for deciduous trees less than 3 m and evergreens less than 2 m in height
- .2 Use 3 guy wires and anchors for deciduous trees greater than 3 m and evergreens greater than 2 m in height.

3.6 MULCHING

- .1 Ensure soil settlement has been corrected prior to installing mulch.
- .2 Spread wood chip mulch to a minimum depth of 75 mm but not more than 125 mm.
- .3 Install mulch by hand around planting.

3.7 MAINTENANCE DURING ESTABLISHMENT PERIOD

- .1 Perform maintenance operations from time of planting to end of the establishment maintenance period.
- .2 Water to maintain soil moisture conditions for optimum establishment, growth and health of plant material without causing erosion.
 - .1 For evergreen plant material, water thoroughly in late fall prior to freeze-up to saturate soil around root system.
- 3 Remove weeds monthly.
- .4 Replace or re-spread damaged, missing or disturbed mulch.
- .5 If required to control insects, fungus and disease, use appropriate control methods in accordance with Federal, Provincial and Municipal regulations. Obtain product approval from Contract Administrator prior to application.
- .6 Remove dead or broken branches from plant material.
- .7 Keep trunk protection and guy wires in proper repair and adjustment.
- .8 Remove and replace dead plants and plants not in healthy growing condition. Make replacements in same manner as specified for original plantings.

3.8 MAINTENANCE DURING WARRANTY PERIOD

- .1 The Contractor shall maintain all plant material for a period of two (2) years from Date of Acceptance. Maintenance requirements shall be as per Section 3.7. Start warranty when plant material installation has been completed and there is no sign of wilting, pest infestation, transplant shock or any conditions deleterious to longevity and appearance. Defective plants shall be replaced within thirty (30) days of notification and shall be further maintained for a period of two years.

3.9 VERIFICATION

- .1 Verification requirements in accordance with Section 01 47 13 - LEED Requirements.

3.10 PLANT SPECIFICATION LIST

NAME COMMON / SCIENTIFIC	SIZE	COMMENTS
<u>Trees:</u>		
AMERICAN ELM / <i>Ulmus americana</i>	60-70 cal 45-50 cal #5 pot; 1500 ht	800 – 900 root ball; 14 (60cal) trees to have root ball depth < 500 600 – 700 root ball
BUR OAK / <i>Quercus macrocarpa</i>	50-60 cal #5 pot; 1200 ht	700 – 800 root ball
DELTA HACKBERRY / <i>Celtis occidentalis</i>	45-50 cal	600 – 700 root ball
DISCOVERY ELM <i>Ulmus davidiana</i> var. <i>Japonica</i> "Discovery"	45-50 cal	600 – 700 root ball
GREEN ASH <i>Fraxinus pennsylvanica</i> var. <i>subintegerrima</i>	#4 pot; 1200 ht	
SUMMIT ASH <i>Fraxinus pennsylvanica</i> "Summit"	60-70 cal 45-50 cal	800 – 900 root ball 600 – 700 root ball
PRAIRIE SPIRE ASH <i>Fraxinus pennsylvanica</i> "Prairie Spire"	45-50 cal	600 – 700 root ball
TREMBLING ASPEN <i>Populus tremuloides</i>	#1 pot	
<u>Shrubs:</u>		
AMERICAN HAZEL <i>Corylus americana</i>	#2 pot	No varietal substitutions, native plants only
BUSH HONEYSUCKLE <i>Diervilla lonicera</i>	#2 pot	No varietal substitutions, native plants only
DOWNY ARROWWOOD <i>Viburnum rafinesquianum</i>	#2 pot #1 pot	No varietal substitutions, native plants only
HEDGE COTONEASTER <i>Cotoneaster acutifolius</i>	#2 pot	
MEYER LILAC <i>Syringa meyeri</i> "Palibin"	#2 pot	
RED OSIER DOGWOOD <i>Cornus sericea</i>	#2 pot	No varietal substitutions, native plants only
SASKATOON <i>Amelanchier alnifolia</i>	#2 pot	No varietal substitutions, native plants only
SNOWBERRY <i>Symphoricarpos occidentalis</i>	#2 pot #1 pot	No varietal substitutions, native plants only

Part 1 General

1.1 REFERENCES

- .1 American Institute of Steel Construction (AISC)
 - .1 AISC 325-05, Steel Construction Manual, Thirteenth Edition.
 - .2 AISC S329, Allowable Stress Design: Specification for Structural Joints Using ASTM A325 or ASTM A490 Bolts.
- .2 American Society for Testing and Materials (ASTM)
 - .1 ASTM A668/A668M-04(2009), Standard Specification for Steel Forgings, Carbon and Alloy, for General Industrial Use.
- .3 Canadian Standards Association (CSA)
 - .1 CSA-C22.2 No. 14-10, Industrial Control Equipment.
 - .2 CSA-S16-09 - Design of Steel Structures.
 - .3 CSA-W47.1-09, Certification of Companies for Fusion Welding of Steel.
 - .4 CSA-W59-03 (R2008), Welded Steel Construction (Metal Arc Welding)
- .4 National Electrical Manufacturers Association (NEMA)
 - .1 NEMA ICS 8-2000 (R2005), Industrial Control and Systems: Crane and Hoist Controllers.
 - .2 NEMA MG 1-2009, Rev 1-2010, Motors and Generators.

1.2 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Provide submittals in accordance with Section 01 33 00 – Submittal Procedures.
- .2 Product Data: Provide manufacturer's printed product literature and data sheets for lift, and include product characteristics, performance criteria, physical size, finish and limitations.
- .3 Shop Drawings:
 - .1 Indicate typical elevations, sections and plans of lift including details of connections, ,equipment, components details,.
- .4 LEED Documentation: Submit a LEED Material Submittal Form, as included in Section 01 33 00. Submittals to identify recycled content, regional content or VOC emission when required by Submittal Requirements.

1.3 CLOSEOUT SUBMITTALS

- .1 Operation and Maintenance Data: provide operation and maintenance data for incorporation into manual specified in Section 01 78 00 – Closeout Submittals.
 - .1 Include all technical data sheets, wiring diagrams and reviewed shop drawings.
 - .2 Indicate lift function, general arrangement and electrical/electronic schematics as well as the type and part number of replacement components used in the lift.

Part 2 Products

2.1 MANUFACTURER

- .1 Pentalift E Series hydraulic scissor lift

2.2 TECHNICAL DATA

- .1 Capacity: 1000 lbs
- .2 Deck plate: steel smooth
- .3 Self contained hydraulic power unit
- .4 Prewired push button on 10' cord
- .5 110v motor
- .6 Safety rails on sides removable
- .7 Safety chains on ends removable
- .8 Provide edge of dock extension
- .9 Finish: grey enamel

Part 3 Execution

3.1 INSTALLATION

.1 Install in accordance with manufacturer's written instructions.

3.2 CLOSEOUT ACTIVITIES

.1 Training: On successful completion, provide for a period of one hour demonstrate and train selected Owner's personnel in operation and maintenance of the equipment supplied. Include complete set of drawings, wiring diagrams, operating and maintenance manual.

END OF SECTION

Part 1 General

1.1 REFERENCES

- .1 American Institute of Steel Construction (AISC)
 - .1 AISC 325-05, Steel Construction Manual, Thirteenth Edition.
 - .2 AISC S329, Allowable Stress Design: Specification for Structural Joints Using ASTM A325 or ASTM A490 Bolts.
- .2 American Society for Testing and Materials (ASTM)
 - .1 ASTM A668/A668M-04(2009), Standard Specification for Steel Forgings, Carbon and Alloy, for General Industrial Use.
 - .2 ASTM A1023/A1023M-09, Standard Specification for Stranded Carbon Steel Wire Ropes for General Purposes.
 - .3 ASTM F959M-07, Standard Specification for Compressible-Washer-Type Direct Tension Indicators for Use With Structural Fasteners.
- .3 ASME International (ASME)
 - .1 ASME B30.10-2009, Hooks.
 - .2 ASME B30.16-2007, Overhead Hoists
 - .3 ASME HST-4-1999(R2010), Performance Standard for Overhead Electric Wire Rope Hoists.
- .4 Canadian Standards Association (CSA)
 - .1 CSA-B167-08, Overhead Travelling Cranes - Design, Inspection, Testing, Maintenance, and Safe Operation.
 - .2 CSA-C22.2 No. 33-M1984 (R2009), Construction and Test of Electric Cranes and Hoists.
 - .3 CSA-C22.2 No. 14-10, Industrial Control Equipment.
 - .4 CSA-S16-09 - Design of Steel Structures.
 - .5 CSA-W47.1-09, Certification of Companies for Fusion Welding of Steel.
 - .6 CSA-W59-03 (R2008), Welded Steel Construction (Metal Arc Welding)
- .5 Crane Manufacturers Association of America (CMAA)
 - .1 CMAA 74-2010, Specification for Top Running and Under Running Single Girder Electric Overhead Cranes Utilizing Under Running Trolley Hoist.
- .6 National Electrical Manufacturers Association (NEMA)
 - .1 NEMA ICS 8-2000 (R2005), Industrial Control and Systems: Crane and Hoist Controllers.
 - .2 NEMA MG 1-2009, Rev 1-2010, Motors and Generators.

1.2 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Provide submittals in accordance with Section 01 33 00 – Submittal Procedures.
- .2 Product Data: Provide manufacturer's printed product literature and data sheets for cranes, and include product characteristics, performance criteria, physical size, finish and limitations.
- .3 Shop Drawings:
 - .1 Provide Shop Drawings stamped and signed by a Professional Engineer registered or licensed in the Province of Manitoba, Canada.
 - .2 Submit shop drawings for review prior to manufacture of cranes.
 - .3 Coordinate crane systems with building components prior to preparing shop drawings.
 - .4 Indicate typical elevations, sections and plans of cranes and hoists including details of connections, track layout, equipment, components details, walkway, fall arrest anchor points, clearances and hook coverage.
 - .5 Indicate wheel loads and locations on the tracks, and loads to be carried by building framing structure.
 - .6 Provide electrical wiring schematics for power and control wiring. Schematics shall include a Bill of Materials complete with equipment ratings. Provide drawings showing electrical equipment closures and layout of all equipment.
- .4 Design Calculations: submit a complete set of design calculations showing: design loads and structural design.

- .5 LEED Documentation: Submit a LEED Material Submittal Form, as included in Section 01 33 00. Submittals to identify recycled content, regional content or VOC emission when required by Submittal Requirements.

1.3 CLOSEOUT SUBMITTALS

- .1 Operation and Maintenance Data: provide operation and maintenance data for incorporation into manual specified in Section 01 78 00 – Closeout Submittals.
 - .1 Include all technical data sheets, wiring diagrams and reviewed shop drawings.
 - .2 Indicate crane function, general arrangement and electrical/electronic schematics as well as the type and part number of replacement components used in the crane system

1.3 QUALITY ASSURANCE

- .1 Qualifications:
 - .1 Manufacturer: Overhead Travelling Crane Systems, including all sub-system components manufactured by vendors, must be designed and manufactured by a company having a minimum of ten years of specialized experience in designing and manufacturing the types of cranes required to meet the contract document specifications and conforming to ASME B30.16.
 - .2 Factory trained and qualified representative to be available during critical periods of installation and testing.
 - .3 Installer: a licensed company specializing in crane installations approved by the manufacturer with a minimum of ten years documented experience.
- .2 All electrical equipment shall be approved by CSA and other authorities having jurisdiction.
 - .1 Design motors for crane and hoist service in accordance with the definitions and requirements of CSA.
 - .2 Controls, including contactors, transformers, terminals, etc., shall be installed in a control panel enclosure rated 4X. The material for the enclosure shall be 316L stainless steel.
 - .3 Permissible stresses for crane structural parts in accordance with CMAA Specifications No. 74.
 - .4 Welding: in accordance with CSA W47.1 and CSA W59 or ISO 5817.
 - .5 Test Reports: Test hoists with a load simulating 125% of rated capacity before shipping. Submit copy of test report to Construction Manager for review.
 - .6 Certifications: Ensure machine is certified by one of the following Certification Organizations. The machine's electrical control must bear a label from one of these organizations. Identify which Organization shall be used:
 - .1 Canadian Standards Association (CSA) 178 Rexdale Blvd. Etobicoke, Ontario M9W 1R3 Phone: 416-747-4000
 - .2 Underwriters' Laboratories of Canada (ULC) 1 Crouse Road Scarborough, Ontario M1R 3A9 Phone: 416-757-3611
 - .3 Warnock Hersey (WH) 3210 American Drive Mississauga, Ontario L4V 1B3 Phone: 905-678-7820 or 902-860-1619
 - .4 ETL Testing Laboratories PO Box 2040 Cortland, New York 13045 Phone: 606-753-6711
 - .5 MET Laboratories, Inc. 914 West Patapsco Ave. Baltimore, Maryland 21230-3420 Phone: 410-354-3300 Fax: 410-354-3313
 - .7 Labels from Underwriters' Laboratories Inc., ETL Testing Laboratories Inc., and MET Laboratories Inc., must be accompanied by a "C" or Canadian Standard number to indicate the product has been certified to the Canadian Standard.
 - .8 Electrical equipment that is not certified by one of the above agencies can only be accepted for use if the equipment is "field" inspected and labelled (complete with verification documentation) by the Canadian Standards Association or Warnock Hersey, under the Special Inspection Program. This inspection must take place before equipment delivery.

1.4 WARRANTY

- .1 The General Contractor shall warranty the bridge cranes and hoists for 12 months after the date of total performance.
- .2 Exclude 12 months preventive maintenance in warranty period. Preventive maintenance will be carried out by the Owner.
- .3 Crane and hoist supplier to have 24 hour service call- out capability.
- .4 Crane and hoist supplier to provide with their proposal a statement of service support available, including anticipated response time to calls.

Part 2 Products

2.1 TECHNICAL DATA

- .1 Type: CXTD double girder crane / profile girder
- .2 Capacity crane: 11 023 lbs
- .3 Span: 57'-6 3/8"
- .4 Duty group steel structure: CMAA C
- .5 Crane weight with hoist: 16 180 lbs
- .6 Structure finishing: W 5 mill, safety yellow
- .7 Runway rail type: ASCE40
- .8 Crane voltage: 3ph/575V/60 Hz, 115 V Control
- .9 Starting / nominal current: 68.5A/17.3A
- .10 Ambient temperature: 41-104 degrees F
- .11 Hoist 1
 - .1 wire rope hoist type: CXR50410050P5
 - .2 max capacity hoist 1: 11 020 lbs
 - .3 Duty group hoist: FEM M6
 - .4 Lifting height: 20'-6 1/8" (max 29'-6 5/16")
 - .5 Trolley type: double girder
 - .6 Reeving type: true lift
- .12 Speeds
 - .1 Hoist 1: hoisting speed: 19/3.3 ft/min, 2 speed
 - .2 Hoist 1 trolley speed: 65 ft/min stepless
 - .3 Bridge travelling speed: 100 ft/min stepless
- .13 Motors
 - .1 Hoist 1: hoist motor power: 12.1/1.9 hp 60% ED
 - .2 Hoist 1: trolley motor power; 2 x 0.3 hp 40% ED
 - .3 Bridge travelling motor power: 2 x 0.08 hp 40% ED
- .14 Controls: radio remote control and pendant control
- .15 Runway and / or runway rails
 - .1 Type: ASCE 40# rail c/w mounting hardware and end stops
 - .2 Length: 2 x 96'-5 1/2"
- .16 Power supply along runway
 - .1 Type: figure 8 bar c/w collectors
 - .2 Length: 2 x 96'-5 1/2"
 - .3 Type of fixing: hangers suspended from runway

Part 3 Execution

3.1 GENERAL

- .1 Coordinate work of this section with related building structure and work of all other trades.
- .2 Fabricate and install crane mechanism and framing in strict accordance with the reviewed shop drawings. In the event of discrepancy do not proceed until all such discrepancies have been resolved.
- .3 Workmanship shall conform to the requirements of CAN/CSA S16.1.

3.2 EXAMINATION

- .1 Verify dimensions and building deflections related to crane installation and fabrication as noted on structural Drawings, prior to finalization of crane order.

3.3 INSTALLATION

- .1 Install in accordance with manufacturer's written instructions.
- .2 Installation shall include all electric wiring and power feeds from local power supply provided by Division 26. Coordinate power wiring with Division 26.
- .3 Installation of cranes and crane components to be done by qualified installers, approved by component manufacturers.
- .4 Shop drawings to be reviewed by manufacturers representative.

3.4 OPERATION AND LOAD TESTING

- .1 Carry out tests and certify cranes meet all performance specifications, in the presence of the Construction Manager.
- .2 Running Test: After erection has been completed, and before being placed into service, the crane machinery shall be operated by power and tests carried out to prove the following:
 - .1 All clearances and alignments are in order.
 - .2 Gearing is sufficiently quiet and lubrication is adequate.
 - .3 Operation of each controller switch, contractor relay and other control devices is satisfactory; all limit switches operate correctly under the most unfavourable conditions.
 - .4 All circuits and interlocks and sequence of operation are correct.
 - .5 All protective devices operate satisfactorily.
 - .6 Each motion of the crane operates satisfactorily.
- .3 Load Test: test each crane motion with hook carrying loads as follows:
 - .1 25% overload: during this test the specified speeds need not be attained but the crane shall show itself capable of dealing with the overload without difficulty.
 - .2 Rated load: during these tests the specified speeds are to be attained, provided that the current supply to the crane is correctly maintained.
 - .3 Brake Test: all brakes shall be tested under full load conditions, from maximum speed to rest, three times in quick succession without overheating.
 - .4 Any work not meeting the requirements of this specification shall be rectified to the satisfaction of the Construction Manager and all costs for such work shall be at this Section's expense.
 - .5 All testing including weights shall be by crane supplier..6 Test and certify crane to CSA B167 code.

3.5 CLOSEOUT ACTIVITIES

- .1 Training: On successful completion, provide for a period of two (2) working days (8 hours each) to demonstrate and train selected Owner's personnel in operation and maintenance of the equipment supplied. Include complete set of drawings, wiring diagrams, operating and maintenance manual.

END OF SECTION

Part 1 General

1.1 SUMMARY

.1 This Section outlines requirements for removal of existing site material and placement of clean fill materials required for the preparation of Yard and parking lot areas, as well as lake excavations, side slopes, and drainage works.

1.2 CITY SPECIFICATIONS, RELATED SECTIONS AND REFERENCES

- .1 City of Winnipeg Standard Construction Specifications:
- .1 CW 3110 – Sub-Grade, Sub-Base, and Base Course Construction.
 - .2 CW 3170 – Earthwork and Grading
 - .3 CW 2165 – Stormwater Retention Basin Revetment and Soil Stabilization
- .2 Related Sections:
- .1 01 33 00 - Submittal Procedures.
 - .2 01 74 19 – Construction Waste Management and Disposal.
 - .3 23 33.01 Excavation Trenching and Backfilling
 - .4 G1010 – Site Clearing
- .3 References:
- .1 ASTM D3786, Standard Test Method for Hydraulic Bursting Strength of Textile Fabrics – Diaphragm Bursting Strength Tester Method.
 - .2 ASTM D4632, Standard Test Method for Grab Breaking Load and Elongation of Geotextiles.
 - .3 ASTM D4751, Standard Test Method for Determining Apparent Opening Size of Geotextile.

1.3 DEFINITIONS

.1 Site Work: covers examination of existing site features and site drainage, clearing and grubbing, materials management, waste management, and site cleanup.

1.4 PERFORMANCE REQUIREMENTS

- .1 Examine preliminary geotechnical soil report titled: *Former Elmwood/ Nairn Avenue Landfill Site Final Preliminary Site Condition Assessment Report* as prepared by KGS Group, located in Appendix A.
- .2 Site earthwork shall be performed in accordance with CW 3170 – Earthwork and Grading.

Part 2 Products

- .1 Materials and products in accordance with CW 3170 – Earthwork and Grading.
- .2 Soil sterilant (herbicide) to be Princep Nine-T™ (Syngenta) or approved equal.
- .3 Silt Fence Barrier:

.1 **Fabric**

.1 The silt fence barrier fabric shall be woven polyester/polypropylene geotextile fabric with the following material properties:

<u>Property</u>	<u>Standard</u>	<u>Test Method</u>
Grab Tensile Strength	330 N	ASTM D4632
Apparent Opening Size	850 microns max	ASTM D4751
Elongation	15%	ASTM D4632
Mullen Burst Strength	1000 kPa	ASTM D3786

.2 Silt fence barrier shall be approved by the Owners Advocate.

.2 **Posts:**

.1 The posts shall be of sufficient strength to meet silt fence barrier performance and maintenance requirements. The posts shall be a minimum of 1.2 metres in length with a maximum spacing of 2.5 metres between posts.

- .2 Posts for silt fence shall be one of the following:
 - .1 Untreated fir or pine, minimum 34 mm x 40 mm in size. One end of the post shall be pointed.
 - .2 Steel having a “U”, “T”, “L” or other cross sectional shape that can resist failure by lateral loads. Steel posts shall have a minimum mass per length of 1.1 kg/m. One end of the steel posts shall be pointed and the other end shall be capped with an orange or red plastic safety cap which fits snugly over the steel post. The Contractor shall submit to the Owners Advocate for review a sample of the capped steel post prior to installation.
- .3 **Fasteners:**
 - .1 When wooden posts are used, nails or staples shall be used to fasten the silt fence barrier fabric to the posts in accordance with Manufacturer’s recommendations.
 - .2 When steel posts are used, tie wire or locking plastic fasteners shall be used to fasten the silt fence barrier fabric to the steel posts, in accordance with the Manufacturer’s recommendations. Maximum spacing of fasteners shall be 200 mm along the length of the steel post.
- .4 **Straw Wattle:**
 - .1 The straw roll shall consist of straw or wood fibre that has been compressed and stuffed into a bio-degradable polyester or plastic netting. The straw or wood fibre roll shall be a minimum of 30.5 cm in diameter.
 - .2 The straw roll shall be anchored with wooden stakes having a 50 mm x 50 mm cross section and a minimum length of 1200 mm. Stakes shall have a minimum spacing along the roll of 1200 mm.

Part 3 Execution

3.1 PREPARATION

- .1 Prior to commencing earthwork and grading, the Contractor shall perform site clearing operations in accordance with Section G1010 – Site Clearing.

3.2 EXCAVATION

- .1 Excavation and placement operations shall be performed in accordance with CW 3170 – Earthwork and Grading.
- .2 Stockpiles of material to be used later shall be sprinkled with water to wet the surface or tarped to prevent wind erosion to the satisfaction of the Owners Advocate.
- .3 Install dewatering system to keep sub-grade dry and convey groundwater away from excavations.
 - .1 Maintain until de-watering is no longer required.
 - .2 Outfall dewatering system to include an acceptable sediment trapping device, in accordance with Erosion Control Plan.

3.3 EROSION AND SEDIMENTATION CONTROL

- .1 Installation.
 - .1 The Contractor shall install silt fence barriers as identified on the Drawings, in this Specification and as directed by the Owners Advocate.
 - .2 The silt fence barriers shall be installed prior to disturbing any soil on Site.
 - .3 Posts shall be spaced a maximum of 2.5 m apart, and shall be driven vertically into the ground to a minimum depth of 450 mm.
 - .1 **By Machine**
 - .1 The geotextile of the machine sliced silt fence shall be inserted by machine in a slit in the soil 150 mm deep. The slit shall be created such that a horizontal chisel point at the base of a soil

- slicing blade slightly disrupts soil upward as the blade slices through the soil. The geotextile shall be mechanically inserted directly behind the soil slicing blade in a simultaneous operation, achieving consistent placement and depth. No turning over (plowing) of soil is allowed for the slicing method. The soil shall be compacted immediately.
- .2 The silt fence barrier shall be installed without sags and have an overlap of 450 mm wherever its length is extended.
 - .3 The completed silt fence barrier shall have a minimum height of 600 mm above the ground surface.
- .2 Maintenance
- .1 All silt fence barriers shall be inspected immediately after any runoff event and at least daily during prolonged rainfall. All required repairs shall be made immediately.
 - .2 The silt fence barriers shall be maintained in place, without gaps, and without undermining, so as to prevent sediment passage through or under the barrier.
 - .3 Silt fence barriers shall be maintained vertical without tears and without sagging and maintain a 450 mm overlap on seams.
- .3 Sediment Removal
- .1 Accumulated sediment shall be removed in a manner that avoids escape to the downstream side of the barriers and avoids damage to them. Sediment shall be removed to the level of the grade existing at the time of barrier installation and shall conform to the following.
 - .1 accumulated sediment shall be removed when it reaches a depth of 200 mm;
 - .2 accumulated sediment shall be removed as necessary to perform maintenance repairs;
 - .3 accumulated sediment shall be removed immediately prior to the removal of the silt fence barrier.
- .4 Silt Fence Barrier Removal
- .1 Silt fence barriers shall be removed when, in the opinion of the Owners Advocate, they are no longer required. Silt fence barriers shall be removed in a manner that:
 - .1 avoids entry of equipment, other than hand held equipment, to any water course; and
 - .2 prevents release of sediment and debris to any water course.
 - .2 Areas disturbed by the installation and removal of the silt fence barrier shall be restored to the original grade or to the satisfaction of the Owners Advocate.
- .5 Straw Wattles
- .1 Installation of the straw wattles shall conform to the manufacturer's recommendations and as accepted by the Owner.
 - .2 Straw wattles shall be installed immediately following the installation of catch basins and land drainage manholes.
 - .3 The straw wattles shall be anchored (through the netting only) with wooden stakes on the downstream side of the roll with a maximum stake spacing of 1200 mm.
 - .4 The Contractor shall maintain the straw wattles until they are no longer necessary. Maintenance consists of keeping the devices functioning effectively. The Contractor shall repair or correct plugged, displaced, damaged, or non-functioning devices to the satisfaction of the Contact Administrator.
 - .5 Any damaged or poorly performing straw wattles as a result of storm events shall be replaced/repared immediately. Re-grading of the slope by hand methods may be required in the event of rill or gully erosion.

3.4 BACKFILLING AND CONTOURING

- .1 Backfilling and contouring activities shall be performed in accordance with City of Winnipeg Standard Construction Specification CW 3170 – Earthwork and Grading.

3.5 FIELD QUALITY CONTROL

- .1 Field quality control methods shall be performed in accordance with City of Winnipeg Standard Construction Specification CW 3170 – Earthwork and Grading.

3.6 SOIL STERILIZATION

- .1 Sterilize soil in stormwater retention basins in accordance with CW 2165 – Stormwater Retention Basin Revetment and Soil Sterilization.

3.7 CLEANING

- .1 Clean and reinstate areas affected by the Work.
- .2 Keep pavement and area adjacent to site clean and free from mud, dirt, and debris at all times.

END OF SECTION