TABLE OF CONTENTS

END OF SECTION

Part 1 GENERAL

1.1 DIVISION OF WORK

.1 Division of the Work among Subcontractors and Suppliers is solely Contractor's responsibility. Contract Administrator and The City assume no responsibility to act as an arbiter to establish subcontract limits between Sections or Divisions of the Work. Observe most recent version of Manitoba Trade Definitions.

1.2 SPECIFICATIONS LANGUAGE AND STYLE

.1 These specifications are written in the imperative mood and in streamlined form. The imperative language is directed to Contractor, unless stated otherwise.

.2 Complete sentences by reading "shall", " Contractor shall", "shall be", and similar phrases by inference. Where a colon (:) is used within sentences and phrases, read the words "shall be" by inference.

.3 Fulfill and perform all indicated requirements whether stated imperatively or otherwise.

.4 When used in the context of a Product, read the word “provide” to mean “supply and install to result in a complete installation ready for its intended use”.

1.3 CONTRACT DOCUMENTS FOR CONSTRUCTION PURPOSES

.1 The City, through the Contract Administrator, will supply Contractor with a complete set of Contract Document in electronic form before commencement of the Work. Contractor may print hard copies for construction purposes as required.

1.4 DOCUMENTS AT THE SITE

.1 The Contractor shall maintain a set of drawings on which Contractor shall make any changes to the Work. These drawings shall be called “As-Built Drawings”. As-Built Drawings shall be kept in good order and shall be available to the Contract Administrator and its representatives for review at the Place of the Work. The Contractor shall record on the As -Built Drawings changes in Work as they occur. Keep the following documents at Place of the Work, stored securely and in good order and available to The City and Contract Administrator in hard copy and electronic form:

- .1 Current Contract Documents, including Drawings, Specifications and addenda.
- .2 Change Orders, Change Directives, and Supplementary Instructions.
- .3 Reviewed Shop Drawings, Product data and samples.
- .4 Field test reports and records.
- .5 Construction progress schedule.
- .6 Meeting minutes.
- .7 Manufacturer’s certifications.

.8 Permits, inspection certificates, and other documents required by authorities having jurisdiction.
.9 Current as-built drawings.
.10 Material Safety Data Sheets (MSDS) for all controlled Products.
.11 COR certification.
.12 Labour and material bond.
.13 Site safety plan.
.14 Daily sign-in sheets.

1.5 EXAMINATION OF THE SITE

.1 Prior to commencing actual construction work, check field conditions, obtain and confirm actual site dimensions, examine surface conditions, etc., as required to ensure correct execution of Work. Notify Contract Administrator in writing, of all matters, which could prejudice proper execution of the Work.

.2 Commencement of construction or any part thereof constitutes acceptance of existing conditions and means dimensions have been considered, verified and are acceptable.

1.6 LAYOUT OF THE WORK

.1 Lay out main lines and levels of the Work in relation to designated reference points and benchmarks.

.2 Protect all stakes and markings from movement or destruction.

1.7 CONTRACTOR'S USE OF PREMISES

.1 Except as otherwise specified, Contractor has use of Place of the Work, restricted to the areas affected by the Work only, from time of Contract award until Substantial Completion of the Work. Refer to Section 01 14 00 – Work Restrictions. If access is required to areas not affected by the Work, permission must be obtained from The City in writing prior to access.

.2 Confine Construction Equipment, Temporary Work, storage of Products, waste products and debris, and all other construction operations to limits required by laws, ordinances, permits, and Contract Documents, whichever is most restrictive. Do not unreasonably encumber Place of the Work.

.3 Encroachment of area beyond property lines is to be separately arranged for with municipal authorities and adjacent property owners.

.4 Obtain consent of adjoining property owners regarding the need for any temporary easements or any other encroachment. Upon completion of Contract, remove any encroachments and make good any damage to adjacent property.

.5 Work on city property to be done to City of Winnipeg standards, minimum, unless noted otherwise.

1.8 EXISTING SERVICES

.1 Notify, Contract Administrator, The City, and utility companies of intended interruption of services and obtain required permission.

.2 Provide alternative routes for personnel, pedestrian, and vehicular traffic.

.3 Establish location and extent of service lines and utilities in area of Work before starting Work. Notify Contract Administrator of findings with a report.

.4 Submit schedule to and obtain approval from Contract Administrator and The City for any shut-down or closure of active service or facility including power and communications services. Adhere to approved schedule and provide notice to affected parties.

.5 Provide temporary services to maintain critical building systems.

.6 Provide adequate bridging over trenches which cross sidewalks or roads to permit normal traffic.

.7 Where unknown services are encountered, immediately advise Contract Administrator and The City and confirm findings in writing.

.8 Protect, relocate or maintain existing active services. When inactive services are encountered, cap off in manner approved by authorities having jurisdiction.

.9 Record locations of maintained, re-routed and abandoned service lines.

.10 Construct barriers in accordance with Section 01 56 00 – Temporary Barriers and Enclosures.

1.9 WORK PROGRESS

.1 Construction shall commence immediately upon signing the Contract in accordance with the submitted construction schedule, and shall continue, without interruption or slow-down, until completion of all Work, except as directed in Section 01 14 00 – Work Restrictions, or as otherwise acceptable to The City.

.2 Provide temporary heating and hoarding as required to protect the Work from damage from freezing, and to allow temperature sensitive work to continue without delay.

1.10 SUPERVISION

.1 The appointed representative shall be employed from commencement of the Work, until 30 calendar days after Substantial Performance of the Work, or such other time as agreed.

1.11 INSURANCE

.1 The Contractor is responsible to ensure that all Subcontractors performing the Work of this contract maintain adequate insurance coverage.

.2 In the event of an incident, occurrence or loss that may result in a claim under any of the above policies, including injuries to the public, or loss or damage to the Work,

the Contractor shall immediately report the incident, occurrence or loss in writing to The City and the Contract Administrator.

END OF SECTION

Part 1 GENERAL

1.1 RESTRICTIONS OF USE ON PREMISES

.1 Unrestricted use of site until Substantial Performance of the Work.

.2 Obtain and pay for use of additional storage or work areas needed for operations under this Contract.

.3 Refer to Section 01 51 00 - Temporary Utilities, Section 01 52 00 – Construction Facilities and Section 01 56 00 - Temporary Barriers and Enclosures, for temporary facilities, access roads and parking areas, traffic regulations, and utilities.

.4 Remove or alter existing work to prevent injury or damage to portions of existing work which remain.

.5 Repair or replace portions of existing work which have been altered during construction operations to match existing or adjoining work, as directed by Contract Administrator.

.6 Ensure that operations conditions of existing work at completion are still the same, equal to or better than that which existed before new work started.

1.2 SECURITY

.1 Contractor is responsible for all additional security and safety of the Work; this includes, but in not limited to, installation of a security fence around the perimeter of the construction zone, coordination of additional security and any costs associated with damage, vandalism or theft in the construction zone. Additional on-site security services must be communicated to and approved in writing by The City.

1.3 ACCESS AND EGRESS

.1 Design, construct, and maintain temporary “access to” and “egress from” Work areas, including, but not limited to, stairs, runways, ramps, ladders, and scaffolding, independent of finish surfaces and in accordance with relevant municipal, provincial, and other regulations.

.2 Ensure “access to” and “egress from” neighboring properties.

END OF SECTION

Part 1 GENERAL

1.1 CASH ALLOWANCES

.1 The Contract Price includes the cash allowances. The scope of work or costs included in such cash allowances shall be as described.

.2 The Contract Price, and not the cash allowances, includes the Contractor's overhead and profit in connection with such cash allowances.

.3 Expenditures under cash allowances shall be authorized by The City through the Contract Administrator.

.4 The value of the work performed under a cash allowance is eligible to be included in progress payments.

1.2 LIMITS

.1 Allowances shall not be exceeded without written authority of The City.

Part 2 CASH ALLOWANCES

2.1 CASH ALLOWANCES

.1 Include in Contract Price a cash allowance in the amount of $10,000.

.2 List of allowances to be covered by amount in 2.1.1:

.1 Unforeseen hazardous materials.

Part 3 APPENDIX

3.1 EXPENDITURE OF CASH ALLOWANCES

.1 The City, through Contract Administrator, will provide Contractor with documentation required to permit pricing of a cash allowance item.

.2 The City, through Contract Administrator, may request Contractor to identify potential Suppliers or Subcontractors, as applicable, and to obtain at least three competitive prices for each cash allowance item.

.3 The City, through Contract Administrator, may request the Contractor to disclose originals of all bids, quotations, and other price related information received from potential Suppliers or Subcontractors.

.4 The City, through Contract Administrator, will determine by whom and for what amount each cash allowance item will be performed. Obtain Owner's prior written approval in the form of a Change Order before entering into a subcontract, amending an existing subcontract, or performing own forces Work included in a cash allowance. Upon issuance of the Change Order, the Contractor's

responsibilities for a cash allowance item shall be the same as for other Work of the Contract.

END OF SECTION

Part 1 GENERAL

1.1 GENERAL CONDITIONS

.1 If any information included within this section conflicts with the General or Supplementary Conditions of the Contract, then the General and Supplementary Conditions shall overrule this section.

1.2 SCHEDULE OF VALUES

.1 Within 10 days of award, submit for Contract Administrator's review an initial schedule of values. Modify the initial schedule of values if and as requested by Contract Administrator. Obtain Contract Administrator's written acceptance of the initial schedule of values prior to the first application for payment.

.2 The values in the progress claim shall be presented in accordance with Trade sections. The value shown for each trade of the Work shall be the total of: the Subcontract Price, the cost of the General Contractor's work applicable to the section, and the allowance for profit and overhead by the General Contractor.

.3 Together with the first and all subsequent applications for payment, submit updated versions of the schedule of values to indicate the values, to the date of application for payment, of Work performed and Products delivered to Place of the Work.

.4 Provide the schedule of values in an electronic spreadsheet format that provides for inclusion of the following information:

.1 Identifying information including title and location of the Work, name of Contractor, number and date of application for payment, and period covered by the application for payment.

.2 A work breakdown structure based on specification sections breakdown. Include separate line items for closeout procedures including closeout submittals, demonstration and training, start-up and testing, and commissioning, collectively valued at minimum 0.5% of Contract Price.

.3 A separate line item for General Conditions (General Contractor Work and supervision).

.4 Provisions for approved Change Orders and allowances so that the breakdown amounts indicated in the schedule of values aggregate to the current total Contract Price.

.5 For each item in the work breakdown structure, provide as a minimum the following information, under headings as indicated:

.1 Breakdown Amount: A dollar amount, including an appropriate pro rata portion of Contactor's overhead and profit.

.2 Performed to Date: The value of Work performed and Products delivered to Place of the Work up to the date of the application for

payment, stated as a percentage of the Contract Price and in dollars.

.3 Previously Performed: The value of Work performed and Products delivered to the Place of the Work for which payment has been previously certified, stated in dollars.

.4 Current Period: The value of Work performed and Products delivered to Place of the Work for which Contractor is currently applying for payment, stated in dollars.

.5 Balance to Complete: The value of Work not yet performed and Products not yet delivered to Place of the Work, stated in dollars.

.5 Applications shall also include a statement as to the amount of GST to be paid by the City, and shall indicate the Contractor's GST Registration Number.

.6 The amount claimed shall be for the value, proportionate to the amount of the Contract, of Work performed at the Place of the Work, and Products delivered to the Place of the Work as of the last day of the payment period.

1.3 CASH FLOW PROJECTION

.1 Prior to the first application for payment, and monthly thereafter, submit, for Contract Administrator's review, a forecast of approximate monthly progress payments for each month of the Contract Time.

.2 Submit revised cash flow forecasts when required due to significant changes in rate of progress of the Work or significant changes in the Contract Price, or when requested by Contract Administrator.

1.4 PAYMENT FOR PRODUCTS STORED OFF SITE

.1 The City may, due to extraordinary circumstances and at The City's sole discretion, make payments for Products delivered to and stored at a location other than Place of the Work, subject to:

.1 a request submitted by Contractor in writing, with appropriate justification, and

.2 whatever conditions The City or Contract Administrator may establish for such payments, as required to protect The City's interests.

END OF SECTION

Part 1 GENERAL

1.1 INTENT

.1 The Contractor shall hold project meetings to provide a forum to ensure the opportunity for adequate and proper job coordination.

1.2 ADMINISTRATIVE

.1 Prepare agenda for meetings.

.2 Distribute written notice of each meeting four (4) days in advance of meeting date to Contract Administrator and the City.

.3 Provide physical space and make arrangements for meetings.

.4 During a health pandemic, special procedures may be required to limit the size of meetings and proximity of participants as Provincially legislated or mandated by

.5 Municipal regulations. In the event of conflict between any of the above provisions,

.6 the most stringent provisions shall apply.

.7 Provide for a video conferencing platform (ie. Zoom, Skype, or other similar

.8 platform).

.9 Preside at meetings.

.10 Record the minutes. Include significant proceedings and decisions. Identify 'action

.11 by' parties.

.12 Produce copies of minutes within three (3) days after each meeting and distribute to

.13 meeting participants, affected parties not in attendance, and the Contract

.14 Administrator team.

.15 Representatives of Contractor, Subcontractors, and suppliers attending meetings

.16 shall be qualified and authorized to act on behalf of the party each represents.

Part 2 MEETINGS

2.1 CONSTRUCTION START UP MEETING

.1 Within 10 days after Contract award, establish the time and location of a construction start-up meeting to review and discuss administrative procedures and responsibilities. Notify Contract Administrator and the City at least five (5) Working Days before the meeting.

.2 Senior representatives of the City, Contract Administrators, and Contractor, including Contractor's project manager and site superintendent, and major Subcontractors, shall be in attendance, or by video conference.

.3 Contractor's representative will chair the meeting and record and distribute the minutes.

.4 Agenda will include following:

.1 Appointment of official representatives of the City, Contractor, Subcontractors, and Contract Administrators from each discipline.
.2 Project communications.
.3 Contract Documents for construction purposes.
.4 Documentation: Bonds, Insurances, Workers Compensation Board Clearance, and Building Permit.
.5 Documents at the site.
.6 Criminal record checks.
.7 Contractor's use of premises.
.8 Work restrictions.
.9 Cash allowances.
.10 Contract modification procedures.
.11 Payment procedures.
.12 Construction progress meetings.
.13 Construction progress schedule, including long lead time items.
.14 Submittals schedule and procedures.
.15 Cash flow forecast.
.16 Special procedures.
.17 Quality requirements, including testing and inspection procedures.
.18 Contractor's mobilization.
.19 Temporary utilities.
.20 Existing utility services.
.21 Construction facilities.
.22 Temporary barriers and enclosures.
.23 Temporary controls.
.24 Field engineering and layout of work.
.25 Site safety, COR, safety meetings.
.26 Site security, staging and fencing.
.27 Cleaning and waste management.
.28 Closeout procedures and submittals, record drawings and manuals.
.29 Commissioning.
.30 Other items.

2.2 CONSTRUCTION PROGRESS MEETINGS

.1 As noted in the Contract, schedule regular bi weekly construction progress meetings for the duration of the Work, at times and locations acceptable to the Contract Administrator. Prepare meeting agendas, chair the meetings, and record and distribute the minutes.

.2 Arrange for and provide physical space for meetings.

.3 Record in the meeting minutes significant decisions and identify action items and action dates by attendees or the parties they represent.

.4 Distribute copies of minutes within three (3) Working Days after each meeting to meeting attendees and any affected parties who may not be in attendance.

.5 Ensure that Subcontractors attend, or by video conference, as and when appropriate to the progress of the Work.

.6 Agenda for each meeting shall include the following, as a minimum:

.1 Approval of minutes of previous meeting.
.2 Work progress since previous meeting.
.3 Field observations, including any problems, difficulties, or concerns.
.4 Construction progress schedule.
.5 Submittals schedule.
.6 Proposed changes in the Work.
.7 Risk registry.
.8 Requests for information.
.9 Site safety issues.
.10 Other business.

.7 Special meetings may be called by the City, Contract Administrator, or Contractor.

END OF SECTION

Part 1 GENERAL

1.1 DETAILED WORK SCHEDULE

.1 Provide as indicated in the Supplementary Conditions to the Contract, and as follows.

.2 Format and Content:

.1 Prepare schedule in the form of a Critical Path Method (CPM) Gantt chart using appropriate scheduling software.

.2 Provide a work breakdown structure identifying key activities, work packages, and major milestones, including long delivery Products, inspection and testing activities, preparation and review of mock-ups, decisions for cash allowances, shutdown or closure activities, demonstration and training activities, and similar items, at a sufficient level of detail to effectively manage construction progress.

.3 Indicate milestone date for Substantial Performance of the Work.

.3 Submission:

.1 Submit schedule via e-mail as .pdf files.

.2 Include copies of letters from all sub-trades and major suppliers, confirming completion dates for their respective trades in the allotted schedule.

.3 Contract Administrator will review format and content of initial schedule and request necessary changes, if any, within 10 Working Days after receipt.

.4 If changes are required, resubmit finalized initial schedule within five (5) Working Days after return of review copy.

1.2 SUBMITTALS SCHEDULE

.1 Format and Content:

.1 Prepare schedule identifying all required Shop Drawing, Product data, and sample submissions, including samples required for testing.

.2 Prepare schedule in electronic format.

.3 Provide a separate line for each required submittal, organized by specifications section names and numbers, and further broken down by individual Products and systems as required.

.4 For each required submittal, show planned earliest date for initial submittal, earliest date for return of reviewed submittal by Contract Administrator, and latest date for return of reviewed submittal without causing delay.

.5 Allow time in schedule for resubmission of submittals, should resubmission e necessary.

.2 Submission:

.1 Submit initial schedule to Contract Administrator within 20 Working Days after Contract award.

.2 Submit schedule via e-mail as .pdf files.

.3 Contract Administrator will review format and content of initial schedule and request necessary changes, if any, within 10 Working Days after receipt.

.4 If changes are required, resubmit finalized schedule within five (5) Working Days after return of review copy.

.5 Submit updated submittals schedule monthly to The City and Contract Administrator.

1.3 SCHEDULE MANAGEMENT

.1 A schedule submitted as specified and accepted by Contract Administrator shall become the baseline schedule and shall be used as the baseline for updates.

.2 At each regular progress meeting, review and discuss current construction progress and submittals schedules with Contract Administrator and The City, including activities that are behind schedule and planned measures to regain schedule slippage in key areas on or near the critical path.

.3 Activities considered behind schedule are those with start or completion dates later than the dates shown on the baseline schedule.

1.4 RECORDING ACTUAL SITE CONDITIONS ON AS-BUILT DRAWINGS

.1 Print a hard copy set of construction Drawings for the purpose of creating as-built drawings. Record information and maintain as-built drawings in clean, dry and legible condition.

.2 Clearly label each drawing as “AS-BUILT DRAWING”. Record information concurrently with construction progress. Do not conceal Work until required information is recorded.

.3 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 pipes, ducts, conduits, outlets, fixtures, access panels, and appurtenances, referenced to visible and accessible features of construction.

.4 Field changes of dimension and detail.

.5 Changes made by Addendum, Change Orders and Supplemental Instructions.

.6 References to Shop Drawings, where Shop Drawings show more detail.

.4 Do not use as-built drawings for construction purposes.

.5 As-Built Drawings shall be kept in good order and shall be available to the City, Contract Administrator and its representative for review at the Place of the Work.

1.5 DAILY SIGN-IN SHEETS

.1 Daily sign-in sheets are to be maintained on site to record the actual times and dates of who is on site, how long they are on site and the trade classification.

.2 Daily sign-in sheets are to be provided to the City upon request.

1.6 DAILY FIELD REPORTS

.1 Daily field reports are to be kept recording the number of tradespeople on site, weather conditions, threats to progress, incidents involving theft or safety, and schedule updates.

.2 Daily field reports are to be provided to the City upon request.

1.7 PHOTOGRAPHIC DOCUMENTATION

.1 Arrange for periodic digital photography to document and provide a photographic record of the progress of the Work.

.2 Preconstruction photographs: take photographs of existing conditions, interior and exterior, of the existing building and site.

.1 Number of viewpoints:

.1 Each side of building.

.2 Interior of rooms and finishes.

.3 Progress photographs:

.1 Viewpoints: Interior and exterior locations of the Work as determined by Contract Administrator. Take photographs of the Work in progress, including the renovation work, and at least one of each type of fire-stopping applied, and as determined by the Contract Administrator, minimum 50 photographs of different conditions per week.

.2 Take photographs of all work that will be concealed with other work prior to concealment.

.3 Provide photographs of corrective measures taken following Site Instructions.

.4 Final photographs:

.1 Number of viewpoints:

.1 Each side of building.

.2 Interior of rooms and finishes.

.3 Completed renovation work, including at least one (1) of each type of fire-stopping applied, and as determined by the Contract Administrator.

.5 Identify each photograph by project name and date taken.

.6 Submit .jpg format files in standard resolution via e-mail.

.7 Do not use progress or any other Project photographs for promotional purposes without The City's written consent.

END OF SECTION

Part 1 GENERAL REQUIREMENTS

1.1 ADMINISTRATIVE

.1 Submit specified submittals to Contract Administrator for review. Submit with reasonable promptness and in orderly sequence so as to not cause delay in Work. Failure to submit in ample time is not considered sufficient reason for an extension of Contract Time or for Product substitutions or other deviations from the Drawings and Specifications.

.2 Where required by authorities having jurisdiction, provide submittals to such authorities for review and approval.

.3 Do not proceed with Work affected by a submittal until review is complete.

.4 Present Shop Drawings, Product data, and samples in same units as the construction drawings. Where items or information is not produced in the same units, converted values are acceptable.

.5 Review submittals, provide verified field measurements where applicable, and affix Contractor's review stamp prior to submission to Contract Administrator. Contractor's review stamp represents that necessary requirements have been determined and verified, and that the submittal has been checked and coordinated with requirements of the Work and Contract Documents.

.6 Verify field measurements and that affected adjacent work is coordinated.

.7 Submittals not meeting specified requirements will be returned with comments.

.8 Reproduction of construction Drawings to serve as background for Shop Drawings is not permitted.

.9 Do not propose Substitutions or deviations from Contract Documents via Shop Drawing, Product data or sample submittals.

.10 Coordinate each submission with requirements of the Work and Contract Documents. Individual shop drawings will not be reviewed until all related drawings are available.

1.2 CONTRACT ADMINISTRATOR'S REVIEW

.1 The Contract Administrator's review will be for conformity of design concept and for general arrangement only. Such review shall not be considered relief of responsibility for errors or omissions in submittals or of responsibility for meeting all requirements of the Contract Documents, unless a deviation has been approved in writing by the Contract Administrator.

1.3 SUBMISSION REQUIREMENTS

.1 Schedule submissions at least ten (10) days before date reviewed submissions will be needed.

.2 Distribute copies of shop drawings and project data which carry Contract Administrator's stamp to:

.1 Job site file,
.2 Record documents file,
.3 Affected Subcontractors, Sub-subcontractors, suppliers and fabricators.

.3 At the time of submission, advise the Contract Administrator in writing of any deviations in the submission from the requirements of the Contract Documents. Obtain the Contract Administrator's acceptance or rejection of such deviation in writing.

Part 2 SUBMITTALS

2.1 SHOP DRAWINGS AND PRODUCT DATA

.1 Indicate Products, methods of construction, and attachment or anchorage, erection diagrams, connections, explanatory notes and other information necessary for completion of the Work.

.2 Where Products attach or connect to other Products, indicate that such items have been coordinated, regardless of Section under which adjacent items will be supplied and installed. Indicate cross-references to Drawings, Specifications and other already reviewed Shop Drawings.

.3 Accompany submittals with a transmittal information including:

.1 Date.
.2 Project title and number.
.3 Contractor's name and address.

.4 Shop Drawing submittals shall include:

.1 Date and revision dates.
.2 Project title and number.
.3 Name and address of:
  .1 Subcontractor.
  .2 Supplier.
  .3 Manufacturer.
.4 Contractor's stamp, date, and signature of Contractor's authorized representative responsible for Shop Drawing review, indicating that each Shop Drawing has been reviewed for compliance with Contract Documents and, where applicable, that field measurements and field construction conditions have been verified. Shop drawings not stamped, signed and dated shall be returned the Contractor without being examined and shall be considered rejected.
.5 Details of appropriate portions of the Work as applicable:
  .1 Fabrication.

.2 Layout, showing dimensions, including identified field dimensions, and clearances.

.3 Setting or erection details.

.4 Capacities.

.5 Performance characteristics.

.6 Standards.

.7 Operating weight.

.8 Wiring diagrams.

.9 Single line and schematic diagrams.

.10 Relationships to other parts of the Work.

.5 Product data submittals shall include material safety data sheets (MSDS) for all controlled Products.

.6 Submit electronic copy of Shop Drawings in Portable Document Format (PDF) where specified in the technical specifications.

.7 Submit electronic copy of Product data sheet or brochures in Portable Document Format (PDF) where specified in the technical specifications.

.8 Where a submittal includes information not applicable to the Work, clearly identify applicable information and strike out non-applicable information.

.9 Supplement standard information to include details applicable to Project.

.10 Allow 10 Working Days for Contract Administrator's review of each submittal and incorporate in submittals schedule specified in Section 01 32 00 – Construction Progress Documentation. Allow additional five (5) Working Days where sub-Contract Administrator or commissioning agent review is required.

.11 If upon Contract Administrator’s review no errors or omissions are discovered, or if only minor corrections are required as indicated, submittal will be returned and fabrication or installation of Work may proceed.

.12 If upon Contract Administrator’s review significant errors or omissions are discovered, a so noted copy will be returned for correction and resubmission. Do not commence fabrication or installation.

.13 Contract Administrator’s notations on submittals are intended to ensure compliance with Contract Documents and are not intended to constitute a change in the Work requiring change to the Contract Price or Contract Time. If Contractor considers any Contract Administrator’s notation to be a change in the Work, promptly notify Contract Administrator in writing before proceeding with the Work.

.14 Resubmit corrected submittals through same procedure indicated above, before any fabrication or installation of the Work proceeds. When resubmitting, notify Contract Administrator in writing of any revisions other than those requested by Contract Administrator.

.15 Shop drawings which require approval of any legally constituted authority having jurisdiction shall be provided to such authority by Contractor for approval.

.16 Pay all costs to distribute submissions for Contract Administrator review.

2.2 SAMPLES

.1 Submit samples for Contract Administrator's review in duplicate where specified in the technical specifications. Label samples as to origin, Project name, and intended use.

.2 Deliver samples prepaid to Contract Administrator's business address.

.3 Notify Contract Administrator in writing of any deviations in samples from requirements of Contract Documents.

.4 Where a required colour, pattern or texture has not been specified, submit full range of available Products meeting other specified requirements.

.5 Contract Administrator selection from samples is not intended to change the Contract Price or Contract Time. If a selection would affect the Contract Price or Contract Time, notify Contract Administrator in writing prior to proceeding with the Work.

.6 Resubmit samples as required by Contract Administrator to comply with Contract Documents.

.7 Reviewed and accepted samples will establish the standard against which installed Work will be reviewed.

.8 Pay all costs to distribute physical samples for Contract Administrator review.

END OF SECTION

Part 1 GENERAL

1.1 BUILDING AND SITE SMOKING ENVIRONMENT

.1 The City has a no smoking policy for the entire workplace. No smoking or vaping is allowed on The City's property.

.2 Smoking or vaping on the premises, including when in vehicles, will not be permitted. This policy applies equally to all staff and Contractor's employees. Contractors are required to bring this policy to the attention of all their employees, subcontractors and suppliers who will be required to work in the building and rigidly enforce this policy.

1.2 RESPECTFUL WORKPLACE

.1 Contractor is to establish Respectful Workplace guidelines and ensure all personnel and Subcontractors follow the guidelines.

1.3 CERTIFICATE OF RECOGNITION (COR)

.1 The Contractor acknowledges it has a current Certificate of Recognition (COR) or a third party audited Safety Accreditation acceptable to Contract Administrator and will maintain this documentation in good standing throughout the term of this Contract.

.2 The Contractor shall take all necessary precautions to ensure partial in place construction is adequately braced against movement and that all hazardous areas are protected to prevent injury or damage to property.

.3 The Contractor shall be entirely responsible for safety of Work during construction.

.4 The Contractor shall execute the Work and provide protection of personnel, occupants, public and property in conformance with the most stringent requirements and regulations of all local codes and by-laws including the Manitoba Building Code, WHMIS and be responsible for obtaining all permits.

.5 The Contractor shall provide prior to commencing Work a detailed Site Safety Plan pertaining to fall protection, scaffolding and confined space entry, including provision for rescue and emergency.

1.4 RESPONSIBILITY

.1 Be responsible for health and safety of persons on site, safety of property on site and for protection of persons adjacent to site and environment to extent that they may be affected by conduct of Work.

.2 Comply with and enforce compliance by employees with safety requirements of Contract Documents, applicable federal, provincial, territorial and local statutes, regulations, and ordinances, COR and with site-specific Health and Safety Plan.

1.5 UNFORSEEN HAZARDS

.1 When unforeseen or peculiar safety related factors, hazards, or conditions occur during performance of Work, follow procedures in place for Employee's Right to Refuse Work in accordance with Acts and Regulations of Province having jurisdiction and advise Contract Administrator verbally and in writing.

1.6 POSTING OF DOCUMENTS

.1 Ensure applicable items, articles, notices and orders are posted in a conspicuous location on site in accordance with Acts and Regulations of Province having jurisdiction, and in consultation with Contract Administrator.

.2 Labour & Material Payment Bond must be posted and available to Subcontractors.

1.7 CORRECTION OF NON-COMPLIANCE

.1 Immediately address health and safety non compliance issues identified by authority having jurisdiction, The City, or by Contract Administrator.

.2 Provide Contract Administrator with written report of action taken to correct non-compliance of health and safety issues identified.

.3 The City or Contract Administrator may stop Work if non-compliance of health and safety regulations is not corrected.

1.8 WORK STOPPAGE

.1 If Work stoppage is required due to any of the following reasons, this shall have precedence over cost and schedule considerations for Work.

- .1 Safety and health of public and site personnel and protection of environment;
- .2 Failure to comply with workers' compensation regulations;
- .3 Using unlicensed contractors;
- .4 Violating environmental protection laws or use of hazardous materials at the construction site;
- .5 Failure to follow the Occupational Health and Safety Act; or
- .6 Any other activity considered illegal according to the regulations.

END OF SECTION

Part 1 GENERAL

1.1 REFERENCE STANDARDS

.1 "Reference standards" means consensus standards, trade association standards, guides, and other publications expressly referenced in Contract Documents.

.2 Where an edition or version date is not specified, referenced standards shall be deemed to be the latest edition or revision issued by the publisher at the time of bid closing. However if a particular edition or revision date of a specified standard is referenced in an applicable code or other regulatory requirement, the regulatory referenced edition or version shall apply.

.3 Reference standards establish minimum requirements. If Contract Documents call for requirements that differ from a referenced standard, the more stringent requirements shall govern.

.4 If compliance with two or more reference standards is specified and the standards establish different or conflicting requirements, comply with the most stringent requirement. Refer uncertainties to Contract Administrator for clarification.

.5 Within the Specifications, reference may be made to the following standards writing, testing, or certification organizations by their acronyms or initialisms:

.1 AA - Aluminum Association
.2 ACI - American Concrete Institute
.3 AISC - American Institute of Steel Construction
.4 ANSI - American National Standards Institute
.5 ASME - American Society of Mechanical Engineers
.6 ASTM - American Society for Testing and Materials
.7 AWMAC - Architectural Woodwork Manufacturers Association of Canada
.8 CGSB - Canadian General Standards Board
.9 CISC - Canadian Institute of Steel Construction
.10 CSA - Canadian Standards Association
.11 CSSBI - Canadian Sheet Steel Building Institute
.12 CWB – Canadian Welding Bureau
.13 ICEA - Insulated Cable Engineers Association
.14 IEEE - Institute of Electrical and Electronics Engineers
.15 MPP – Master Painters Institute
.16 MSS - Manufacturers Standardization Society of the Valve and Fittings Industry
.17 NAAMM - National Association of Architectural Metal Manufacturers
.18 NEMA - National Electrical Manufacturers Association
.19 NFPA - National Fire Protection Association
.20 NHLA - National Hardwood Lumber Association
.21 NLGA - National Lumber Grades Authority
.22 SSPC – The Society for Protective Coatings
.23

.24 TTMAC - Terrazzo, Tile and Marble Association of Canada
.25 ULC - Underwriters' Laboratories of Canada

1.2 INDEPENDENT INSPECTION AND TESTING AGENCIES

.1 Except as otherwise specified, The City will retain and pay for independent inspection and testing agencies to inspect, test, or perform other quality control reviews of parts of the Work.

.2 Retain and pay for inspection and testing as follows:

.1 Inspection and testing required by laws, ordinances, rules, regulations or orders of public authorities
.2 Inspection and testing performed exclusively for Contractor's convenience
.3 Testing, adjustment and balancing of conveying systems, mechanical and electrical equipment and systems
.4 Mill tests and certificates of compliance
.5 Tests specified to be carried out by Contractor under the supervision of Contract Administrator
.6 Additional tests where tests or inspections by designated testing agent reveal Work not in accordance with Contract requirements, as Contract Administrator may require to verify acceptability of corrected Work.

.3 Section 01 21 00 – Allowances specifies a cash allowance for independent inspection and testing services to be retained and paid for by Contractor. Cash allowance excludes any inspection and testing that is for Contractor’s own quality control or is required by regulatory requirements.

.4 Employment of inspection and testing agencies by Contractor or The City does not relieve Contractor from responsibility to perform the Work in accordance with Contract Documents.

.5 For inspection and testing required by Contract Documents or by authorities having jurisdiction, provide Contract Administrator and inspection and testing agencies with timely notification in advance of required inspection and testing.

1.3 CONTRACTOR’S RESPONSIBILITIES

.1 Allow and arrange for inspection and testing agencies to have access to the Work, including access to offsite manufacturing and fabrication plants.

.2 Furnish labour and facilities to:

.1 Provide access to Work to be inspected and tested,
.2 Facilitate inspections and tests,
.3 Make good work disturbed by inspection and testing.

.3 Submit test samples required for testing in accordance with submittals schedule specified in Section 01 32 00 – Construction Progress Documentation.

.4 Provide labour, Construction Equipment and temporary facilities to obtain and handle test samples on site.

.5 Provide heating and hoarding when required if testing is to be done in inclement weather conditions. For testing window leakage, provide heating and hoarding to maintain 5°C for 3 hours prior to and 8 hours after completion of testing.

.6 Pay costs for uncovering and making good Work that is covered before required inspection or testing is completed and accepted by Contract Administrator.

1.4 INSPECTION AND TESTING AGENCY REPORTS

.1 For inspection and testing required by Contract Documents or by regulatory requirements, and performed by Contractor retained inspection and testing agencies, submit to Contract Administrator and the City copies of reports. Submit within five (5) Working days after completion of inspection and testing.

.2 For inspection and testing performed by The City retained inspection and testing agencies, copies of inspection and testing agency reports will be provided to Contractor.

1.5 MOCK-UPS

.1 Prepare mock-ups of Work as specified in the technical specifications. If a mock-up location is not indicated in the Drawings or Specifications, locate where directed by Contract Administrator.

.2 Notify Contract Administrator in writing of any deviations in mock-up from requirements of Contract Documents.

.3 Modify mock-up as required until Contract Administrator approval is obtained.

.4 Approved mock-ups establish an acceptable standard for the Work.

.5 Protect mock-ups from damage until the Work they represent is complete.

.6 Unless otherwise specified in the technical specifications, approved mock-ups forming part of the Work may remain as part of the Work.

.7 Remove mock-ups only when the Work they represent is complete or when otherwise directed by Contract Administrator.

END OF SECTION

Part 1 GENERAL

1.1 SUMMARY

.1 This Section includes regulatory requirements applicable to the Contract Documents and the Project and Work. This section shall cover the general requirements for regulatory requirements pertaining to the Work and is supplementary to all other regulatory requirements mentioned or referenced elsewhere in the Contract Documents.

.2 The applicable edition of all codes shall be that currently adopted at the time of issuance of permits by the authority having jurisdiction and shall include all modifications and additions adopted by that authority.

.3 The applicable date of laws and ordinances shall be that of the date of performance of the Work affected by such laws and ordinances.

.4 Specific reference in the Specifications to codes and regulations or to requirements of regulatory agencies shall mean the latest edition of each adopted by the regulatory agency in effect at the time of issuance of permits.

.5 All materials, installation, and construction shall comply with the applicable provisions of current laws, codes, safety rules, and regulations of local, federal and any other applicable authorities (“Codes”).

.6 Codes referenced in the Contract Documents shall have full force and effect as though set out in full in these Specifications. Nothing in the Contract shall be construed to permit Work not conforming to applicable Code requirements.

.7 The Codes and other authorities referenced in the Contract Documents are not a comprehensive list of all Codes applicable to the Work; the Codes listed in the Contract Documents are referenced for the information and convenience of the Contractor only. The Contract Administrator does not represent that all Codes applicable to the Work have been cited or adequately described in the Contract Documents. Contractor is solely responsible for compliance with all Codes applicable to the Work and relevant to the Contractor's means and methods of performing said Work.

1.2 REFERENCES TO REGULATORY REQUIREMENTS

.1 General: References to codes, standards or regulatory requirements made on Drawings or in Specifications are considered an integral part of Contract Documents as minimum requirements.

.2 All statutes, ordinances, laws, rules, codes, regulations, standards, and lawful orders of all public authorities have jurisdiction of the Work, are hereby incorporated into these Contract Documents as if repeated in full herein and are intended to be included in any reference to Code or Building Code, unless

otherwise specified, including, without limitation, any of the references specified in this section.

.3 Referenced Codes, laws, ordinances, rules and regulations shall have full force and effect as though printed in full in these Specifications. Contractor is assumed to be and shall be familiar with these requirements, including having readily available access to these requirements.

.4 References on the Drawings or in the Specifications to "code", "Code" or "building code" similar terms, not otherwise identified, shall mean the codes indicated above in .2 together with all additions, amendments, changes, and interpretations adopted by code authorities of the jurisdiction having authority over the Project.

.5 Contractor shall conform to all applicable federal, provincial, and local codes, laws, ordinances, rules and regulations, whether or not referenced in the Contract Documents. Compliance with applicable regulatory requirements is the responsibility of the Contractor.

1.3 PRECEDENCE

.1 Where requirements differ from the requirements of applicable codes, ordinances, standards, and the authority having jurisdiction, the more stringent requirements shall take precedence with no change in Contract Sum or Contract Time.

.2 Where Contract Documents require or describe Products or execution of better quality, higher standard or greater size than required by applicable codes, ordinances and standards, Contract Documents shall take precedence so long as such increase is legal.

.3 Where no requirements are identified on Contract Documents, comply with all requirements of applicable codes, ordinances and standards of governing authorities have jurisdiction.

1.4 CODES

.1 Applicable Codes: The codes that apply to this Project include, but are not limited to, the currently adopted editions of the following. Comply with Codes in effect at the time of issuance of permits.

.1 MBC – Manitoba Building Code.
.2 MPC – Manitoba Plumbing Code.
.3 MFC – Manitoba Fire Code.
.4 MECB – Manitoba Energy Code for Buildings
.5 MEC – Manitoba Electrical Code
.6 All local codes including amendments to the preceding listed codes.

.2 Application of the Codes:

.1 Whenever there is a conflict between general and specific requirements in the code, the specific requirements shall be followed.
.2 Where differences exist between codes affecting this Work, the code affording the greatest protection shall govern.

.3 Where codes other than those listed in this Section are referred to in the different sections of the Specifications, it is understood that they apply fully as if cited herein.

.4 All Work performed shall be in accordance with applicable codes; a copy of each shall be kept at the jobsite.

.5 If Contractor observes that the Drawings and Specifications are at variance with the codes, he or she shall notify the Contract Administrator, in writing, at once.

1.5 INDUSTRY STANDARDS

.1 Application:

.1 The industry standards applicable to the Work are indicated in appropriate individual sections of these Specifications, either by their names and the names of the trade associations, government agencies or other producers of standards, or by well-recognized abbreviations thereof.

.1 Refer questions on the meaning of abbreviated designations to the Contract Administrator for clarification before proceeding with Work affected thereby.

.2 Comply with standards in effect at the date of these Contract Documents, except where a standard or specific date or edition is indicated.

.2 Any material specified by reference to the number, symbol, or title of a specific standard, such as Commercial Standard, Federal Specifications, American Society for Testing Materials, a trade association standard, or other similar standard, shall comply with the requirements in the latest revision thereof and any amendments or supplements thereto in effect on the date of Contract Documents.

.3 The standard referred to, except as modified in the Contract Documents, shall have full force and effect as though printed in these Specifications.

.4 These standards are not furnished to Contractor since manufacturers and trades involved are assumed to be familiar with their requirements. Where copies of standards are needed for proper performance of the Work, the Contractor shall obtain such copies which shall be maintained at the jobsite by the Contractor and made available for review on request by the Contract Administrator.

.5 Where referenced standard Specifications require weather protection, it shall be provided by the Contractor at no additional cost to the City and shall be deemed necessary in order to construct the Project within the specified time period.

1.6 APPLICABLE LAWS, ORDINANCES, AND REGULATIONS

.1 Work shall be accomplished in conformance with all applicable laws, ordinances, rules and regulations of federal, provincial, and local governmental agencies and jurisdictions having authority over the Project.

.2 Work shall be accomplished in conformance with all rules and regulations of public utilities and utility districts.

.3 Where such laws, ordinances, rules and regulations require more care or greater time to accomplish Work, or require better quality, higher standards or greater size of Products, Work shall be accomplished in conformance to such requirements with no change to the Contract Time and Contract Sum, except where changes in laws, ordinances, rules and regulations occur subsequent to time of issuance of permits.

.4 No Change Order shall be considered for any change in any applicable federal, provincial or local code or regulation if similar language existed in an alternate applicable regulation in force at the time of issuance of permits.

.5 Contractor shall not allow design or construction of any conditions wherein the finished Work will not comply with current applicable codes. No Change Order shall be considered for the Work correction of any Work not complying with code.

END OF SECTION

Part 1 GENERAL

1.1 TEMPORARY UTILITIES GENERAL

.1 Provide temporary utilities as specified and as otherwise necessary to perform the Work expeditiously.

.2 Remove temporary utilities after use.

.3 "Provide" means arrange and pay for associated items.

1.2 TEMPORARY WATER SUPPLY

.1 Connect to and use The City's existing water supply for temporary use during construction, subject to existing available volume and pressure. Usage at no cost to Contractor.

.2 Provide necessary water supply connections and disconnections.

1.3 TEMPORARY HEATING AND VENTILATION

.1 Contractor may connect to and use The City's existing supply for temporary use during construction, subject to existing available volume and pressure. Usage at no cost to Contractor.

.2 Vent construction heaters in enclosed spaces to the outside or use flameless type of construction heaters.

.3 Provide temporary heat for the Work as required to:

.1 Facilitate progress of Work.
.2 Protect the Work against dampness and cold.
.3 Prevent moisture condensation on surfaces, freezing, or other damage to finishes or stored Products.
.4 Maintain specified minimum ambient temperatures and humidity levels for storage, installation and curing of Products.
.5 After building is enclosed, maintain interior temperature of minimum 10 degrees C.

.4 Provide temporary heat as required to maintain temperatures of minimum 20 degrees C in all occupied areas affected by the Work.

.5 Provide temporary ventilation for the Work as required to:

.1 Prevent accumulations of fumes, exhaust, vapours, gases and other hazardous, noxious, or volatile substances in enclosed spaces, as required to maintain a safe work environment meeting applicable regulatory requirements.
.2 Provide local exhaust ventilation to prevent harmful accumulation of hazardous substances into atmosphere of occupied areas.

.3 Dispose of exhaust materials in manner that will not result in harmful exposure to persons.
.4 Ventilate temporary sanitary facilities.

.6 New permanent building heating and ventilation systems may be used during construction, at Contractor's option. If used during construction:

.1 Before systems are put into use, Mechanical Contract Administrator must perform an inspection of the system and approve use in writing.
.2 The City will pay utility costs resulting from the use of permanent systems.
.3 Operate systems in a non-wasteful and energy efficient manner. Be responsible for any system damage.
.4 Just prior to Substantial Performance of the Work, replace filters, clean and perform other required maintenance to ensure systems are in as near as new condition as possible.
.5 Ensure that systems manufacturers' warranties do not commence until the date of Substantial Performance of the Work or, if manufacturers' warranties do commence earlier when systems are put into use, arrange for necessary extension of manufacturers' warranties or provide equivalent coverage under Contractor's warranty.

1.4 TEMPORARY ELECTRICAL POWER AND LIGHTING

.1 Connect to and use The City's existing electrical supply for temporary use during construction. Contractor is responsible to determine if electrical supply can support usage. Usage at no cost to Contractor.

.2 Arrange and pay for necessary connections and disconnections of temporary power and lighting in accordance with regulatory requirements.

.3 New permanent building power and lighting systems may be used during construction, at Contractor's option. If used during construction:

.1 The City will pay utility costs resulting from the use of permanent systems.
.2 Operate systems in a non-wasteful and energy efficient manner. Be responsible for any system damage.
.3 Just prior to Substantial Performance of the Work, replace lamps which have been used for more than 3 months.
.4 Ensure that systems manufacturers' warranties do not commence until the date of Substantial Performance of the Work or, if manufacturers' warranties do commence earlier when systems are put into use, arrange for necessary extension of manufacturers' warranties or provide equivalent coverage under Contractor's warranty.

1.5 SITE LIGHTING

.1 Arrange and pay for temporary site lighting for nighttime hours during construction, to discourage vandalism and theft. Install lamps in suitable locations to obtain unobstructed light over the entire site.

.2 Perform daily inspection of all temporary lighting and replace any burnt-out, missing or damaged lamps. Relocate promptly any lights that become obstructed by new Work.

END OF SECTION

Part 1 GENERAL

1.1 CONSTRUCTION FACILITIES GENERAL

.1 Provide temporary construction facilities as necessary for performance of the Work and in compliance with applicable regulatory requirements.

.2 Field offices, sheds, storage and other temporary facilities shall be located in areas acceptable to the Contract Administrator and the City.

.3 Maintain temporary construction facilities in good condition for the duration of the Work.

.4 Remove temporary construction facilities from Place of the Work when no longer required.

1.2 CONTRACTOR'S OFFICE

.1 Provide and maintain in a clean condition, for the entire progress of the Work, a suitable temperature controlled and ventilated office, with suitable lighting, of sufficient size to accommodate site meetings.

.2 Furnish office to allow for proper filing and examination of Contract Documents and regulatory documents.

.3 Furnish office with a table and chairs to accommodate required persons for site meetings. Space shall be such that there will be no interference or conflict with Contractor's daily office usage.

1.3 OFFICES WITHIN BUILDING

.1 When usable space is available within the project building proper, and if acceptable to the Contract Administrator and the City, the Contractor's office may be located within the building.

.2 Such areas may be used contingent upon there being no delay in completion of the Work and there being no damages to new materials or finishes.

1.4 SUBCONTRACTORS OFFICES

.1 Subcontractors are to provide themselves with office space as necessary, located as directed by General Contractor.

1.5 EQUIPMENT AND TOOL STORAGE

.1 Provide and maintain, in a clean and orderly condition, adequate lockable storage spaces for tools and equipment.

END OF SECTION

Part 1 GENERAL

1.1 BARRIERS AND ENCLOSURES - GENERAL

.1 Provide temporary barriers and enclosures necessary to protect the public and to secure Place of the Work during performance of the Work.

.2 Comply with applicable regulatory requirements.

.3 Maintain temporary barriers and enclosures in good condition for the duration of the Work.

.4 Remove temporary barriers and enclosures from Place of the Work when no longer required, and make good damaged surfaces.

1.2 FENCING

.1 Provide barricades around the construction site (on the construction side of the

.2 existing traffic routes) to protect the public and prevent access to the construction

.3 site. Barrier shall conform to the requirements of the authorities having jurisdiction.

.4 Provide lockable access gates as required to facilitate construction access.

1.3 WEATHER ENCLOSURES

.1 Provide weather tight enclosures to unfinished door and window openings, tops of shafts and other openings in floors and roofs.

.2 Provide weather enclosures to protect floor areas where walls are not finished and to enclose work areas that require temporary heating.

.3 Design weather enclosures to withstand wind pressure and snow loading requirements.

1.4 EMERGENCY ACCESS ROUTES

.1 Maintain emergency access routes, including overhead clearances, for use by emergency response vehicles.

1.5 PROTECTION OF BUILDING FINISHES

.1 Provide necessary temporary barriers and enclosures to protect existing and completed or partially completed finished surfaces from damage during performance of the Work.

.2 Contractor would be responsible for damages incurred due to lack of or improper or inappropriate protection.

1.6 GUARD RAILS AND BARRICADES

.1 Provide secure, rigid guard rails and barricades around deep excavations, open shafts, open stair wells, open edges of floors and roofs.

.2 Provide secure, rigid guard rails and barricades around doors to prevent public entering the Work site.

1.7 PUBLIC TRAFFIC FLOW

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

.2 Where required, maintain accessible access to public or tenants.

.3 Maintain ingress and egress of neighbouring properties where affected by Work of the Project.

1.8 PROTECTION FOR OFF SITE AND PUBLIC PROPERTY

.1 Protect surrounding private and public property from damage during performance of Work.

.2 Be responsible for damage incurred.

END OF SECTION

Part 1 GENERAL

1.1 TEMPORARY CONTROLS - GENERAL

.1 Provide temporary controls as necessary for performance of the Work and in compliance with applicable regulatory requirements.

.2 Maintain temporary controls in good condition for the duration of the Work.

.3 Remove temporary controls and Construction Equipment used to provide temporary controls from Place of the Work when no longer required.

1.2 PLANT PROTECTION

.1 All possible care shall be taken to avoid damage to existing trees.

.2 Where protection of existing trees and plants cannot be maintained, do not proceed with Work without consulting Contract Administrator and The City.

1.3 DUST AND PARTICULATE CONTROL

.1 Implement and maintain dust and particulate control measures in accordance with applicable regulatory requirements.

.2 Execute Work by methods that minimize dust from construction operations and spreading of dust on site or to adjacent properties.

.3 Provide temporary enclosures to prevent extraneous materials resulting from sandblasting or similar operations from contaminating air beyond immediate work area.

.4 Cover or wet down dry materials and rubbish to prevent blowing dust and debris. Provide dust control for temporary roads.

.5 Use appropriate covers on trucks hauling fine, dusty, or loose materials.

1.4 DEWATERING

.1 Provide temporary drainage and pumping as necessary to dewater excavations, trenches, foundations, and other parts of the Work. Maintain such areas free of water arising from groundwater or surface run-off, as required to keep them stable, dry, and protected from damage due to flooding.

.2 Maintain standby equipment necessary to ensure continuous operation of dewatering system.

.3 Do not pump water containing suspended materials or other harmful substances into waterways, sewers or surface drainage systems. Treat or dispose of such water in accordance with applicable regulatory requirements.

1.5 SITE DRAINAGE

.1 Maintain grades to ensure proper site drainage.

.2 Prevent precipitation from infiltrating or from directly running off stockpiled materials. Cover stockpiled materials with an impermeable liner during periods of work stoppage including at end of each Working Day.

.3 Control surface drainage from cuts and fills, from borrow and waste disposal areas, from stockpiles, staging areas, and other work areas as required to prevent erosion and sedimentation.

.4 Control surface drainage by ensuring that gutters are kept open and water is not directed across or over pavements or sidewalks, except through pipes or properly constructed troughs. Ensure that runoff from unfinished areas is intercepted and diverted to suitable outlets.

1.6 EROSION AND SEDIMENT CONTROL

.1 Minimize amount of bare soil exposed at one time. Stabilize disturbed soils as quickly as practical to minimize erosion. Remove accumulated sediment resulting from construction activity from adjoining surfaces, drainage systems, and watercourses, and repair damage caused by soil erosion and sedimentation.

.2 Provide and maintain appropriate temporary measures such as silt fences, straw bales, ditches, geotextiles, drains, berms, terracing, riprap, temporary drainage piping, sedimentation basins, vegetative cover, dikes, and other measures that may be required to prevent erosion and migration of silt, mud, sediment, and other debris.

.3 Do not disturb existing embankments or embankment protection.

.4 Periodically inspect erosion and sediment control measures to detect evidence of erosion and sedimentation. Promptly take corrective measures when necessary.

.5 If soil and debris from site accumulate in ditches or other low areas, remove accumulation and restore area to original condition.

1.7 POLLUTION CONTROL

.1 Take measures to prevent contamination of soil, water, and atmosphere through uncontrolled discharge of noxious or toxic substances and other pollutants, potentially causing environmental damage.

.2 Be prepared, by maintaining appropriate materials, equipment, and trained personnel on site, to intercept, clean up, and dispose of spills or releases that may occur.

.3 Promptly report spills and releases that may occur to:

.1 authority having jurisdiction,
.2 person causing or having control of pollution source, if known, and
.3 The City and Contract Administrator.

.4 Contact manufacturer of pollutant, if known and applicable, to obtain material safety data sheets (MSDS) and ascertain hazards involved and precautions and measures required in cleanup or mitigating actions.

.5 Take immediate action to contain and mitigate harmful effects of the spill or release.

1.8 BRACING

.1 Brace the structure in all directions to safely withstand all lateral forces, which may be encountered during erection. The bracing shall remain in place until all walls and structural members, with roof deck, are in place.

1.9 PROTECTION FOR EXISTING BUILDINGS, OFF-SITE AND PUBLIC PROPERTY

.1 Protect existing buildings, and adjacent private and public property from damage during performance of Work.

.2 During excavation, provide sheeting, piling or shoring as may be required to protect adjacent building foundations, utilities and streets from movement.

.3 Be responsible for all damages incurred due to improper protection.

1.10 ROOF PROTECTION

.1 Enforce roof protection procedures and inform all subtrades what they need to do to conform to these procedures. Contractor shall be held liable for all costs to repair damages as a result of failure to enforce the roof protection plan.

.2 Where hoisting occurs adjacent to building surfaces, hang tarpaulins to protect

.3 Provide protective covering consisting of 19mm (3/4”) thick plywood underlaid with 25mm (1”) thick polystyrene insulation board adhered to same, below hoist rigs, ladders, pallets of material, and in other circumstances where roofing membrane is exposed to potential damage.

.4 Roof Installer: at start of roofing system installation, institute appropriate procedures working with General Contractor and Roof Contract Administrator/inspection agency for surveillance and protection of completed roof during remainder of construction period until project is turned over to The City.

.5 General Contractor/Roof Installer: at Substantial Performance of the Work, make final inspections of roofing system, and complete ALL punch lists. Submit confirmation of completed punch lists to Contractor and Contract Administrator/inspection agency.

END OF SECTION

Part 1 GENERAL

1.1 REFERENCE STANDARDS

.1 Within text of each Specifications section, reference may be made to reference standards.

.2 Conform to these reference standards, in whole or in part as specifically requested in the Specifications.

.3 If there is question as to whether Products or systems are in conformance with applicable standards, Contract Administrator reserves right to have such Products or systems tested to prove or disprove conformance.

.4 Cost for such testing will be born by the City in event of conformance with Contract Documents or by Contractor in event of non-conformance.

.5 For Products specified by association, trade, or other consensus standards, comply with requirements of the standard, except when more rigid requirements are specified or are required by applicable codes.

.6 Conform to reference standard by date of issue current on date of Contract Documents, except where a specific date is established or required by code.

.7 Neither the contractual relationships, duties, or responsibilities of the parties in Contract nor those of the Contract Administrator shall be altered from the Contract Documents by mention or inference otherwise in any reference document.

1.2 GENERAL

.1 Provide Products that are new, not damaged or defective, of specified design and quality, performing to published ratings, suitable for purpose intended, and for which replacement parts are readily available subject to specified requirements. If requested by Contract Administrator, furnish evidence as to type, source and quality of Products provided.

.2 When material or equipment is specified by standard of performance specification, upon request of Contract Administrator, obtain from manufacturer an independent testing laboratory report, stating that material or equipment meets or exceeds specified requirements.

.3 Procurement policy is to acquire, in cost effective manner, items containing highest percentage of recycled and recovered materials practicable consistent with recycled and recovered materials and in otherwise utilizing recycled and recovered materials in execution of Work.

.4 Defective materials, equipment and articles whenever found, will be rejected, regardless of previous inspections. Reviews by the Contract Administrator does not relieve responsibility but is merely a precaution against oversight or error. Remove

and replace defective materials at own expense and be responsible for all unnecessary delays and expenses caused by rejection.

.5 Should any dispute arise as to the quality or fitness of materials, equipment or articles, the decision rests strictly with the Contract Administrator based upon the requirements of the Contract Documents.

.6 Unless otherwise specified, maintain uniformity of manufacture for like items throughout.

.7 Permanent manufacturer's markings, labels, trademarks, and nameplates on Products are not acceptable in prominent locations, except where required by regulatory requirements or for operating instructions, or when located in mechanical or electrical rooms.

.8 All equipment required to be C.S.A. approved shall carry the C.S.A. label or C.S.A. testing laboratory listing.

.9 All materials, equipment and fixtures required to be fire rated, shall carry the ULC label or ULC testing laboratory listing.

1.3 IMPERIAL SIZE MATERIALS

.1 Availability:

.1 At the time of construction of the various building elements, certain materials and equipment may not be available in imperial sizes, but only in metric sizes.

.2 Contractor is cautioned to check the availability of imperial sized materials with sub-trades and where metric sizes would cause incompatibility affecting the Work, to make adjustments as may be required to make the several parts of the Work come together.

.2 Costs: there shall be no additional cost to the City resulting from this requirement.

.3 Review:

.1 The Contractor, upon award of the Contract, shall review the Work affected with the Contract Administrator.

.2 This review shall occur at first job progress meeting (refer to Section 01 31 19 – Project Meetings).

.3 Contract Administrator will endeavor to provide additional instruction or clarification as may be required.

1.4 PRODUCT OPTIONS

.1 Unless a product is accepted by the Contract Administrator in writing as an approved equal product, then:

.1 Wherever a Product or manufacturer is specified by a single proprietary name, provide the named Product only.

.2 Wherever more than one Product or manufacturer is specified by proprietary name for a single application, provide any one of the named Products.

.2 Wherever a Product is specified by reference to a standard only, provide any Product that meets or exceeds the specified standard. If requested by Contract Administrator, submit information verifying that the proposed Product meets or exceeds the specified standard.

.3 Wherever a Product is specified by descriptive or performance requirements only, provide any Product that meets or exceeds the specified requirements. If requested by Contract Administrator, submit information verifying that the proposed Product meets or exceeds the specified requirements.

1.5 PRODUCT AVAILABILITY AND DELIVERY TIMES

.1 Promptly upon Contract award and periodically during construction, review and confirm Product availability and delivery times. Order Products in sufficient time to meet the construction progress schedule and the Contract Time, and provide confirmation of orders upon request.

.2 If a specified Product is no longer available, promptly notify Contract Administrator. Contract Administrator will take action as required.

.3 If delivery delays are foreseeable, for any reason, promptly notify Contract Administrator and The City.

.1 If a delivery delay is beyond Contractor's control, Contract Administrator will provide direction.

.2 If a delivery delay is caused by something that was or is within Contractor's control, Contractor shall propose actions to maintain the construction progress schedule for Contract Administrator's review and acceptance.

.4 In the event of failure to notify the Contract Administrator at commencement of Work and should it subsequently appear that Work may be delayed for such reason, the Contract Administrator reserves the right to substitute more readily available products of a similar character at no increase in Contract Price.

1.6 STORAGE, HANDLING, AND PROTECTION

.1 Store, handle, and protect Products during transportation to Place of the Work and before, during, and after installation in a manner to prevent damage, adulteration, deterioration and soiling.

.2 Comply with manufacturer's instructions for storage, handling and protection.

.3 Store packaged or bundled Products in original and undamaged condition with manufacturer's seals and labels intact. Do not remove from packaging or bundling until required in Work.

.4 Comply with the requirements of the workplace hazardous materials information system (WHMIS) regarding use, handling, storage, and disposal of hazardous

materials, including requirements for labeling and the provision of material safety data sheets (MSDS).

.5 Store Products subject to damage from weather in weatherproof enclosures.

.6 Store cementitious materials clear of earth or concrete floors, and away from walls.

.7 Keep sand, when used for grout or mortar materials, clean and dry. Store sand on wooden platforms and cover with waterproof tarpaulins during inclement weather.

.8 Store sheet Products and lumber on flat, solid, supports and keep clear of ground. Slope to shed moisture.

.9 Arrange storage of Products to permit access for inspection. Periodically inspect to verify Products are undamaged and are maintained in acceptable condition.

.10 Remove and replace damaged Products.

1.7 TRANSPORTATION COSTS OF PRODUCTS

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

1.8 MANUFACTURER'S INSTRUCTIONS

.1 Unless otherwise indicated in Specifications, install or erect Products in accordance with manufacturer's instructions. Do not rely on labels or enclosures provided with Products. Obtain written instructions directly from manufacturers.

.2 Comply with specified standards as minimum quality for the Work except where more stringent tolerances, codes, or specified requirements indicate higher standards or more precise workmanship.

.3 Verify that field measurements are as indicated on Shop Drawings or as instructed by the manufacturer.

.4 Notify Contract Administrator in writing, of conflicts between Specifications and manufacturer's instructions, so Contract Administrator may establish course of action.

.5 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.

.6 Submit field Drawings to indicate relative position of various services and equipment when required by Contract Administrator.

.7 Improper installation or erection of Products, due to failure in complying with these requirements,- authorizes Contract Administrator to require removal and re installation at no increase in Contract Price or Contract Time.

1.9 QUALITY OF WORK

.1 Ensure Quality of Work is of highest standard, executed by workers experienced and skilled in respective duties for which they are employed. Immediately notify

Contract Administrator if required Work is such as to make it impractical to produce required results.

.2 Perform Work by persons qualified to produce required and specified quality.

.3 Do not employ anyone unskilled in their required duties. The City reserves right to require dismissal from site, workers deemed incompetent or careless.

.4 Decisions as to standard or fitness of Quality of Work in cases of dispute rest solely with Contract Administrator and The City, whose decision is final.

.5 Monitor quality control over Suppliers, manufacturers, Products, services, site conditions, and workmanship to produce Work of the specified quality.

.6 Secure Products in place with positive anchorage devices designed and sized to withstand stresses, vibration, physical distortion, or disfigurement.

1.10 COORDINATION

.1 Contractor is responsible for coordination of Work of various Subcontractors.

.2 Ensure full cooperation of all workers in laying out Work. Maintain efficient and continuous supervision.

.3 Ensure that the Work of various Subcontractors does not conflict or create interference, thus assuring satisfactory performance of Work.

.4 Be responsible for coordination and placement of openings, sleeves and accessories.

.5 All items required to be built in, including anchors, ties, dovetail slots, nailing strips, blocking, sleeves, etc., are to be supplied as and when required, together with templates, measurements and shop drawings.

.6 Ensure all workers examine the drawings and specifications covering the Work of others, which may affect the performance of their own Work. Examine the Work of others and report to the Contract Administrator, in writing, any defects or deficiencies, which may affect the Work. In the absence of any report, the Contractor shall be held to have waived all claims for damage to or defects in such Work.

.7 Ensure that components requiring foundations or openings required for the installation of this Work, is coordinated. Furnish the necessary information to the Sections concerned in ample time to permit allowance for such items. Failure to comply with this requirement does not relieve the party at fault of the cost of cutting or drilling at a later date and subsequent patching.

1.11 CONCEALMENT

.1 In finished areas, conceal pipes, ducts and wiring in floors, walls and ceilings, except where indicated otherwise.

.2 Before installation, inform Contract Administrator if there is interference. Install as directed by Contract Administrator.

.3 Ensure Contract Administrator inspections have been completed and Work is approved prior to concealing the Work.

.4 Contract Administrator reserves the right to direct the Contractor to reveal concealed Work that was not inspected at the sole cost of the Contractor for inspection. Contractor will bear the cost for making good.

.5 Refer to Section 01 73 00 – Execution.

1.12 LOCATION OF EQUIPMENT AND FIXTURES

.1 Consider location of equipment, fixtures, outlets, and mechanical and electrical items indicated as approximate.

.2 Inform Contract Administrator of conflicting installation. Install as directed.

.3 Refer to Section 01 73 00 – Execution.

1.13 FASTENINGS

.1 Provide metal fastenings and accessories in same texture, colour and finish as adjacent materials, unless indicated otherwise.

.2 Prevent electrolytic action between dissimilar metals and materials.

.3 Use non corrosive hot dip galvanized steel fasteners and anchors for securing Work, unless stainless steel or other material is specifically requested in affected Specification Section.

.4 Refer to Section 01 73 00 – Execution.

1.14 FASTENINGS - EQUIPMENT

.1 Use fastenings of standard commercial sizes and patterns with material and finish suitable for service.

.2 Use heavy hexagon heads, semi-finished unless otherwise specified.

.3 Use plain type washers on equipment, sheet metal and soft gasket lock type washers where vibrations occur. Use resilient washers with stainless steel.

.4 Refer to appropriate Specification and Drawings for further detail. Reference manufacturer's Specifications.

.5 Refer to Section 01 73 00 – Execution.

1.15 EXISTING UTILITIES

.1 When breaking into or connecting to existing services or utilities, execute Work at times directed by local governing authorities, with minimum of disturbance to pedestrians, vehicular traffic, Work, and/or building occupants.

.2 Protect, relocate or maintain existing active services. When services are encountered, cap off in manner approved by authority having jurisdiction. Stake and record location of capped service.

.3 Refer to Section 01 73 29 – Cutting and Patching.

END OF SECTION

Part 1 GENERAL

1.1 SUMMARY

.1 Except where otherwise specified in technical specifications or otherwise indicated on Drawings, comply with requirements of this section.

1.2 MANUFACTURER'S INSTRUCTIONS

.1 Install, erect, or apply Products in strict accordance with manufacturer's instructions.

.2 Notify Contract Administrator, in writing, of conflicts between Contract Documents and manufacturer's instructions where, in Contractor's opinion, conformance with Contract Documents instead of the manufacturer's instructions may be detrimental to the Work or may jeopardize the manufacturer's warranty.

.3 Do not rely on labels or enclosures provided with Products. Obtain written instructions directly from manufacturers.

.4 Provide manufacturer's representatives with access to the Work at all times. Render assistance and facilities for such access so that manufacturer's representatives may properly perform their responsibilities.

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

1.3 CONCEALMENT

.1 Conceal pipes, ducts, and wiring in floors, walls and ceilings in finished areas:

.1 after review by Contract Administrator and authority having jurisdiction, and
.2 where locations differ from those shown on Drawings, after recording actual locations on as-built drawings.

.2 Provide incidental furring or other enclosures as required.

.3 Notify Contract Administrator in writing of interferences before installation.

1.4 FASTENINGS GENERAL

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

.2 Prevent electrolytic action and corrosion between dissimilar metals and materials by using suitable non-metallic strips, washers, sleeves, or other permanent separators to avoid direct contact.

.3 Use non-corrosive fasteners and anchors for securing exterior work [and in spaces where high humidity levels are anticipated].

.4 Space anchors within individual load limit or shear capacity and ensure they provide positive permanent anchorage.

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

.6 Do not use fastenings or fastening methods that may cause spalling or cracking of material to which anchorage is made.

1.5 FASTENINGS EQUIPMENT

.1 Use fastenings of standard commercial sizes and patterns with material and finish suitable for service.

.2 Bolts shall not project more than one diameter beyond nuts. Cut off exposed bolts in public areas flush with the nut.

1.6 FIRE RATED ASSEMBLIES

.1 When penetrating fire rated walls, ceiling, or floor assemblies, completely seal voids with fire-stopping materials, smoke seals, or both, in full thickness of the construction element as required to maintain the integrity of the fire rated assembly.

1.7 BUILDING ENVELOPE ASSEMBLIES

.1 Ensure the continuity of the building envelope as indicated on the drawings, including insulation of the proper RSI (R) value, air/vapour barrier as specified, and backing.

1.8 LOCATION OF FIXTURES, OUTLETS AND DEVICES

.1 Consider location of fixtures, outlets, and devices indicated on Drawings as approximate.

.2 Locate equipment, fixtures, outlets, and devices to provide minimum interference, maximum usable space, and as required to meet safety, access, maintenance, acoustic, and regulatory, including barrier free, requirements.

.3 Promptly notify Contract Administrator in writing of conflicting installation requirements for fixtures, outlets, and devices. If requested, indicate proposed locations and obtain approval for actual locations.

.4 Submit field drawings to indicate relative position of various services and equipment when required by Contract Administrator.

1.9 PROTECTION OF COMPLETED WORK AND WORK IN PROGRESS

.1 Adequately protect parts of the Work completed and in progress from any kind of damage.

.2 Promptly remove, replace, clean, or repair, as directed by Contract Administrator, work damaged as a result of inadequate protection.

.3 Do not load or permit to be loaded any part of the Work with a weight or force that will endanger the safety or integrity of the Work.

.4 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 Contract Administrator.

1.10 REMEDIAL WORK

.1 Notify Contract Administrator of, and perform remedial work required to, repair or replace defective or unacceptable work. Ensure that properly qualified workers perform remedial work. Coordinate adjacent affected work as required. Perform in a manner to neither damage nor put at risk any portion of the Work.

1.11 ACTION AND INFORMATIONAL SUBMITTALS

.1 Submit written request in advance of cutting or alteration which affects:

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

.2 Include in request:

.1 Identification of Project.
.2 Location and description of affected Work.
.3 Statement on necessity for cutting or alteration.
.4 Description of proposed Work, and Products to be used.
.5 Alternatives to cutting and patching.
.6 Effect on Work of The City or separate Contractor.
.7 Written permission of affected separate Contractor.
.8 Date and time Work will be executed.

1.12 PREPARATION

.1 Inspect existing conditions, including elements subject to damage or movement during cutting and patching.

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

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

.4 Provide supports to assure structural integrity of surroundings; provide devices and methods to protect other portions of Project from damage.

.5 Provide protection from elements for areas which may be exposed by uncovering Work; maintain excavations free of water.

1.13 EXECUTION

.1 Execute cutting, fitting, and patching including excavation and fill, to complete Work.

.2 Fit several parts together, to integrate with other Work.

.3 Uncover Work to install ill-timed Work.

.4 Remove and replace defective and non-conforming Work.

.5 Provide openings in non-structural elements of Work for penetrations of mechanical and electrical Work.

.6 Execute Work by methods to avoid damage to other Work, and which will provide proper surfaces to receive patching and finishing.

.7 Employ original installer to perform cutting- and patching for weather-exposed and moisture resistant elements, and sight exposed surfaces.

.8 Cut rigid materials using masonry saw or core drill. Pneumatic or impact tools not allowed on masonry Work without prior approval.

.9 Restore Work with new Products in accordance with requirements of Contract Documents.

.10 Fit Work airtight to pipes, sleeves, ducts, conduit, and other penetrations through surfaces.

.11 At penetration of fire rated wall, ceiling, or floor construction, completely seal voids with fire stopping material, full thickness of the construction element.

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

.13 Conceal pipes, ducts and wiring in floor, wall and ceiling construction of finished areas except where indicated otherwise.

.14 Where pipes, ducts and wiring cannot be concealed in floors, walls and ceilings install furring/bulkheads finished with drywall. Coordinate locations and dimensions in consultation with Contract Administrator prior to commencement.

.15 Meet or exceed Product manufacturer's installation requirements.

1.14 SUB-DIVISION OF WORK

.1 The Specifications have generally been divided into sections for the purpose of ready reference, but a section may consist of the Work of more than one trade Subcontractor or Supplier.

.1 The responsibility for determining which Subcontractor or Supplier provides labour, material, equipment and services to complete the Work rests solely with the Contractor.

.2 No extras will be allowed on grounds of differences of interpretation of Contract Documents as to which Subcontractor or Supplier is to provide

labour, material, equipment or services, including the taking of field measurements.

1.15 CONTRACTOR'S RESPONSIBILITIES

.1 Ensure the Work erected is in compliance with Contract Documents-and be responsible for delays or costs resulting from failure to inspect or co ordinate, and for any replacement or corrective Work required.

.2 Provide advance notification to, and coordination with/between, Other Contractors, Subcontractors, and those otherwise performing Work of other sections.

1.16 COMMISSIONING

.1 Ensure testing, adjusting, balancing, and certification of mechanical and electrical installations and other automated systems or equipment are executed in compliance with Contract Documents.

END OF SECTION

Part 1 GENERAL

1.1 REQUEST FOR CUTTING, PATCHING AND REMEDIAL WORK

.1 Submit written request in advance of cutting, coring, or alteration which affects or is likely to affect:

.1 Structural integrity of any element of the Work.
.2 Integrity of weather-exposed or moisture-resistant elements.
.3 Efficiency, maintenance, or safety of any operational element.
.4 Visual qualities of sight-exposed elements.
.5 Work of The City or other contractors.
.6 Warranty of Products affected.
.7 Likely to disturb environmental hazards, including, but not limited to, asbestos, lead, mould, PCBs or vermiculite.

.2 Include in request:

.1 Identification of Project.
.2 Location and description of affected work, including drawings or sketches as required.
.3 Statement on necessity for cutting or alteration.
.4 Description of proposed work, and Products to be used.
.5 Alternatives to cutting and patching.
.6 Effect on work of The City or other contractors.
.7 Written permission of affected other contractors.
.8 Date and time work will be executed.

1.2 PRODUCTS

.1 Unless otherwise specified, when replacing existing or previously installed Products in the course of cutting and patching work, use replacement Products of the same character and quality as those being replaced.

.2 If an existing or previously installed Product must be replaced with a different Product, submit request for substitution.

1.3 PREPARATION

.1 Provide supports to ensure structural integrity of surroundings; provide devices and methods to protect other portions of the Work from damage.

.2 Provide protection from elements for areas that may be exposed by uncovering work.

1.4 EXISTING UTILITIES

.1 When breaking into or connecting to existing services' utilities, execute the Work at times directed by local governing authorities, with a minimum of disturbance to the Work, pedestrian and vehicular traffic, and ongoing City operations.

.2 Maintain excavations free of water.

.3 Keep duration of interruptions to a minimum.

.4 Protect and maintain existing active services. Record location of services, including depth, on as-built Drawings.

.5 Construct or erect barriers in accordance with Section 01 56 00 – Temporary Barriers and Enclosures as required to protect pedestrian and vehicular traffic.

.6 Refer to Section 01 61 00 – Common Product Requirements.

1.5 CUTTING, PATCHING, AND REMEDIAL WORK

.1 Coordinate and perform the Work to ensure that cutting and patching work is kept to a minimum.

.2 Perform cutting, fitting, patching, and remedial work to make the affected parts of the Work come together properly and complete the Work.

.3 Provide openings in non-structural elements of the Work for penetrations of mechanical and electrical work.

.4 Perform cutting by methods to avoid damage to other work. Cutting to be "neat" sizes. Patch all edges so fixture frames hide cut edges.

.5 Provide proper surfaces to receive patching, remedial work, and finishing.

.6 Perform cutting, patching, and remedial work using competent and qualified specialists familiar with the Products affected, in a manner that neither damages nor endangers the Work.

.7 Do not use pneumatic or impact tools without Contract Administrator’s prior approval.

.8 Ensure that cutting, patching, and remedial work does not jeopardize manufacturers’ warranties.

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

.10 Fit work to pipes, sleeves, ducts, conduit, and other penetrations through surfaces with suitable allowance for deflection, expansion, contraction, acoustic isolation, and firestopping.

.11 Maintain fire ratings of fire rated assemblies where cutting, patching, or remedial work is performed. Completely seal voids or penetrations of assembly with firestopping material to full depth or with suitably rated devices.

END OF SECTION

Part 1 GENERAL

1.1 REGULATORY REQUIREMENTS

.1 Comply with applicable regulatory requirements when disposing of waste materials.

.2 Obtain permits from authorities having jurisdiction and pay disposal fees where required for disposal of waste materials and recyclables.

1.2 GENERAL CLEANING REQUIREMENTS

.1 Provide adequate ventilation during use of volatile or noxious substances. Do not rely on building ventilation systems for this purpose.

.2 Prevent cross-contamination during the cleaning process.

.3 Notify the Contract Administrator of the need for cleaning caused by The City or other contractors.

.4 Conduct cleaning up and disposal of construction waste to comply with local ordinances and anti-pollution laws.

.5 Prevent accumulation of wastes which create hazardous conditions.

.6 Should the Contractor fail to perform ongoing or final cleanup when required by the City, the City may have the cleanup performed by whatever means may be expedient and all associated costs will be charged to the Contractor. The City may set-off such costs against any amount owing to the Contractor.

Part 2 MATERIALS

2.1 CLEANING MATERIALS

.1 Use only cleaning materials recommended by manufacturer of surface to be cleaned, and as recommended by cleaning material manufacturer.

Part 3 EXECUTION

3.1 PROGRESSIVE CLEANING AND WASTE MANAGEMENT

.1 Maintain Work in tidy condition, free from accumulation of waste products and debris.

.2 Provide appropriate, clearly marked, containers for collection of waste materials and recyclables.

.3 Remove waste materials and recyclables from work areas, separate, and deposit in designated containers at end of each Working Day. Collect packaging materials for recycling or reuse.

.4 Remove all waste materials and debris from the site at regular scheduled times or dispose of as otherwise directed by the Contract Administrator.

.5 Clear snow and ice from public sidewalks and parking areas as required to comply with applicable municipal regulatory requirements, and from access to building. Bank/pile snow in designated areas only or remove from site as directed by the City or Contract Administrator.

.6 Regularly maintain existing lawn on site to the approval of the City.

.7 Make arrangements with and obtain permits from authorities having jurisdiction for off-site disposal of waste and debris.

.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 Schedule cleaning operations so that resulting dust, debris and other contaminants will not fall on wet, newly painted surfaces nor contaminate building systems.

.11 Remove all construction waste materials and debris from the building and site, and clean soiled areas immediately. Maintain adjacent corridors and the site free of construction waste and soiling.

3.2 FINAL CLEANING

.1 Before final cleaning, arrange a meeting at Place of the Work to determine the acceptable standard of cleaning. Ensure that the City, Contract Administrator, Contractor and cleaning company are in attendance.

.2 Remove from Place of the Work surplus Products, waste materials, recyclables, Temporary Work, tools and Construction Equipment not required to perform any remaining work.

.3 Remove waste products and debris other than that caused by others, and leave Work clean and suitable for occupancy.

.4 Provide professional cleaning by a qualified, established cleaning company.

.5 Lock or otherwise restrict access to each room or area after completing final cleaning in that area.

.6 Inspect finishes, fitments, and equipment and ensure specified workmanship and operation.

.7 Re-clean as necessary areas that have been accessed by Contractor’s workers prior to The City occupancy.

.8 Remove stains, spots, marks, and dirt from finished surfaces, electrical and mechanical fixtures, furniture fitments, walls, floors and ceilings.

.9 Clean and polish glass, mirrors, hardware, wall tile, stainless steel, chrome, porcelain enamel, baked enamel, plastic laminate, aluminum and all other finished

surfaces, including mechanical and electrical fixtures. Replace broken, scratched or otherwise damaged glass.

.10 Remove dust and stains from lighting reflectors, lenses, lamps, bulbs, and other lighting surfaces.

.11 Vacuum clean and dust all new and renovated exposed wall, floor, and ceiling surfaces, behind grilles, louvres and screens, and above suspended ceiling tiles.

.12 Clean mechanical, electrical, and other equipment. Replace filters for mechanical equipment if equipment is used during construction.

.13 Remove waste material and debris from crawlspaces and other accessible concealed spaces.

.14 Remove stains, spots, marks, and dirt from exterior facades.

.15 Clean exterior and interior window glass and frames.

.16 Clean and sweep roofs, clear roof drains.

.17 Sweep clean, power wash, or remove snow and ice from exterior sidewalks, steps and platforms, driveways, roads, parking lots, and other paved surfaces.

.18 Use leaf blowers to clean landscaped surfaces. Rake clean other surfaces of grounds. Mow lawn.

.19 Remove all dirt and other disfigurations from new and altered exterior surfaces.

3.3 WASTE MANAGEMENT AND DISPOSAL

.1 Dispose of waste materials and recyclables at appropriate municipal landfills and recycling facilities in accordance with applicable regulatory requirements.

.2 Do not burn or bury waste materials at Place of the Work.

.3 Do not dispose of volatile and other liquid waste such as mineral spirits, oil, paints and other coating materials, paint thinners, cleaners, and similar materials together with dry waste materials or on the ground, in waterways, or in storm or sanitary sewers. Collect such waste materials in appropriate covered containers, promptly remove from Place of the Work, and dispose of at recycling facilities or as otherwise permitted by applicable regulatory requirements.

.4 Cover or wet down dry waste materials to prevent blowing dust and debris.

3.4 CLEANING OF STREETS

.1 Conform to local ordinances and by-laws relating to littering of streets.

.2 Take precautions to prevent depositing mud or debris on public or private roadways adjacent to the Work. Clean up immediately or the Contract Administrator will direct necessary clean up with all costs charged to the Contractor by deducting costs from the next progress payment.

3.5 REMOVAL OF TEMPORARY FACILITIES

.1 On completion of project, remove all temporary offices and furniture, hoardings, fencing, tree and plant protection, and all other items used to aid in the performance of the Work. Return site to original condition as at start of the Work.

END OF SECTION

Part 1 GENERAL

1.1 GENERAL

.1 Notify the City one (1) month prior to anticipated takeover to make arrangements for insurance and coordinate takeover of utilities.

.2 Refer to Section 01 78 43, Spare Parts and Maintenance Materials, and provide written confirmation signed by the City, that all spare parts and maintenance materials have been provided to the City as prescribed therein.

1.2 SUBSTANTIAL COMPLETION OF THE WORK

.1 Contractor's Inspection: Before applying for the Contract Administrator's review to establish Substantial Completion of the Work:

.1 Ensure that the specified prerequisites to Substantial Completion of the Work are completed.

.1 Follow final cleaning instructions per Section 01 74 00 – Cleaning and Waste Management.

.2 Provide the following operations and maintenance documents: outline the specific O&M documents reasonably necessary for immediate operation and maintenance.

.3 Ensure start-up requirements are completed.

.4 Demonstration and training of The City's on-site personnel is scheduled.

.2 Conduct an inspection of the Work to identify defective, deficient, or incomplete work.

.3 Prepare a comprehensive and detailed list of items to be completed or corrected.

.4 Provide an anticipated schedule and costs for items to be completed or corrected.

.2 Acceptance of Work Procedures:

.1 Contractor's Inspection: Contractor shall conduct inspection of Work, identify deficiencies and defects, and repair as required to conform to Contract Documents.

.1 Notify Contract Administrator in writing of satisfactory completion of Contractor's inspection and submit verification that corrections have been made.

.2 Request Contract Administrator's inspection.

.2 Contract Administrator's Inspection:

.1 Contract Administrator and Contractor to inspect Work and identify defects and deficiencies.

.2 Contractor to correct Work as directed.

.3 Completion Tasks: submit written certificates in English that tasks have been performed as follows:

.1 Work: completed and inspected for compliance with Contract Documents.

.2 Defects: corrected and deficiencies completed.

.3 Equipment and systems: tested, balanced, adjusted and fully operational.

.4 Certificates required by Fire Commissioner, Boiler Inspection Branch and Utility companies: submitted.

.5 Operation of systems: demonstrated to The City's personnel.

.6 Commissioning of mechanical systems: completed in accordance with Contract Documents.

.7 Work: complete and ready for final inspection.

.4 Final Inspection:

.1 When completion tasks are done, request final inspection of Work by Contract Administrator, The City and Contractor.

.2 When Work incomplete according to Contract Administrator, complete outstanding items and request re-inspection.

.3 Declaration of Substantial Performance: when Contract Administrator considers deficiencies and defects corrected and requirements of Contract substantially performed, make application for Certificate of Substantial Performance.

.5 Outstanding deficiencies on the date of Substantial Completion shall be recorded for warranty purposes.

1.3 PREREQUISITES TO FINAL PAYMENT

.1 After Substantial Completion and before submitting an application for final payment in accordance with the General Conditions of Contract:

.1 Correct or complete all remaining defective, deficient, and incomplete work.

.2 Remove from the Place of the Work all remaining surplus Products, Construction Equipment, and Temporary Work.

.3 Perform final cleaning and waste removal necessitated by Contractor’s work performed after Substantial Completion, as specified in Section 01 74 00 – Cleaning and Waste Management.

.4 Turn over all keys for the building, systems, and equipment. Request and sign for any key(s) retained/used for completion of the Work, as acceptable to the City.

.5 Record all utility readings with the City at the date of Substantial Completion.

.6 Coordinate completion of any outstanding deficiencies with the City to avoid disruption to the City's use.

1.4 WARRANTY PERIODS

.1 Refer to General Conditions GC 12.3, for warranty periods. Note that warranty does not start on deficiencies listed at the date of Ready-for-Takeover until their completion or repair.

.2 During the month prior to the end of the project warranty period, the City, the Contract Administrator and the Contractor will conduct an inspection of the project. Promptly remedy any defects due to faulty materials or workmanship.

END OF SECTION

Part 1 GENERAL

1.1 OPERATION AND MAINTENANCE MANUAL

.1 Prepare a comprehensive operation and maintenance manual, in the languages of the Contract, using personnel qualified and experienced for this task.

.2 Submit an initial draft of the operation and maintenance manual for Contract Administrator's review. If required by Contract Administrator's review comments, revise manual contents and resubmit for Contract Administrator's review. If required, repeat this process until Contract Administrator accepts the draft manual in writing.

.3 Submit final version to The City in hard copy and electronic format. Provide three (3) hard copies.

1.2 OPERATION AND MAINTENANCE MANUAL FORMAT

.1 Organize data in the form of an instructional manual.

.2 Binders: black vinyl, hard covered, three D-rings, loose leaf, 216 x 279mm, 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 typed or printed title "Operation and Maintenance Manual", name of Project or facility, and 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 or 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 Include electronic copy of Shop Drawings in manual as 1:1 scaled CAD files in .pdf format on electronic media acceptable to The City.

.10 Provide electronic copy of manual in PDF format.

1.3 OPERATION AND MAINTENANCE MANUAL – GENERAL CONTENT

.1 Table of contents for each volume.

.2 Introductory information including:

.1 Date of manual submission.

.2 Complete contact information for Contract Administrator, Subconsultants, and Contractor, and Subcontractors, with names of responsible parties.

.3 Schedule of Products and systems indexed to content of volume.

.3 For each Product or system, include complete contact information for Subcontractors, Suppliers and manufacturers, including local sources for supplies and replacement parts.

.4 Product Data: mark each sheet to clearly identify specific products, options, and component parts, and data applicable to installation. Delete or strike out inapplicable information. Supplement with additional information as required.

.5 Reviewed Shop Drawings.

.6 Permits, certificates, letters of assurance and other relevant documents issued by or required by authorities having jurisdiction.

.7 Warranties and Performance Bond.

.8 Operating and maintenance procedures, incorporating manufacturer's operating and maintenance instructions, in a logical sequence.

.9 Training materials as specified in Section 01 79 00 – Demonstration and Training.

.10 Addenda.

1.4 OPERATION AND MAINTENANCE MANUAL – EQUIPMENT AND SYSTEMS CONTENT

.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 engineering 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.

.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 coordination 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 testing and balancing reports.

.15 Include additional content as specified in technical Specifications sections. Refer to Mechanical specifications, and Electrical drawings.

1.5 OPERATION AND MAINTENANCE MANUAL – PRODUCTS AND FINISHES CONTENT

.1 Include Product data, with catalogue number, options selected, 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 Include an outline of requirements for routine and special inspections and for regular maintenance to ensure that on-going performance of the building envelope will meet the initial building envelope criteria.

.4 Include copy of finish hardware including addenda or changes during construction.

.5 Included copy of full colour schedule including addenda or changes during construction.

.6 Include additional content as specified in technical Specifications sections.

1.6 OPERATION AND MAINTENANCE MANUAL – WARRANTIES CONTENT

.1 Separate each warranty with index tab sheets keyed to Table of Contents listing.

.2 List each warrantor with complete contact information.

.3 Verify that documents are in proper form and contain full information. Ensure that warranties are for the correct duration and are in The City’s name.

1.7 CONTRACTOR’S AS-BUILT DRAWINGS

.1 Submit final as-built drawings in the form specified in Section 01 32 00 – Construction Progress Documentation to Contract Administrator.

1.8 RECORD DRAWINGS

.1 The Contractor shall transfer all 'As-Built' information to electronic (Revit) Record Drawings. The Contractor, on completion of a release form provided by the Contract Administrator, will be provided an electronic (Revit) file at an 'Issued for Construction' state.

.2 The Contractor may pay the Contract Administrator to have information transferred from the 'As-Built' drawings to a set of electronic (Revit) Record Drawings. Submit marked-up set of 'As-Built' drawings to the Contract Administrator showing information to be included on record drawings at least 15 working days prior to Substantial Performance of the Work. The Contract Administrator will prepare electronic Record Drawings based on the marked-up 'As-Built' drawings for a fee of $200 per drawing, with a minimum charge of $1,000.

.3 Contractor will provide the City with a hard copy and digital copy of the Record Drawings.

1.9 SPARE PARTS, MAINTENANCE MATERIALS, AND SPECIAL TOOLS

.1 Supply spare parts, maintenance materials, and special tools in quantities specified in technical specifications sections.

.2 Ensure spare parts and maintenance materials are new, not damaged nor defective, and of same quality, manufacturer, and batch or production run as installed Products.

.3 Provide tags for special tools identifying their function and associated Product.

.4 Deliver to and store items at location directed by The City at Place of the Work. Store in original packaging with manufacturer's labels intact and in a manner to prevent damage or deterioration.

.5 Catalogue all items and submit to Contract Administrator an inventory listing organized by Specifications section. Include Contract Administrator reviewed inventory listing in operation and maintenance manual.

END OF SECTION

Part 1 GENERAL

1.1 SUMMARY

.1 Demonstrate and provide training to The City's personnel on operation and maintenance of equipment and systems prior to scheduled date of Substantial Performance of the Work.

.2 The City will provide list of personnel to receive training and will coordinate their attendance at agreed upon times.

.3 Coordinate and schedule demonstration and training provided by Subcontractors and Suppliers.

1.2 ACTION AND INFORMATIONAL SUBMITTALS

.1 Submit proposed dates, times, durations, and locations for demonstration and training of each item of equipment and each system for which demonstration and training is required. Allow sufficient time for training and demonstration for each item of equipment or system, or time as may be specified in technical specifications.

.2 Contract Administrator and The City will review submittal and advise Contractor of any necessary revisions.

.3 Submit report(s) within five (5) Working Days after completion of demonstration and training:

.1 identifying time and date of each demonstration and training session,
.2 summarizing the demonstration and training performed, and
.3 including a list of attendees.

.4 If requested by the City, submit video record of demonstration and training together with report.

.1 Video record training instructions for operation, range of features, control, adjustment, maintenance and servicing of fixtures and equipment.
.2 Capture within the recording, video and audio, the instructor's training presentations for each item.
.3 Recording camera(s) must be attended by dedicated operator during recording sessions to assure subject material is visible and readable when viewed as training material. Operator is to utilize a tripod to steady the video recording device where possible.

1.3 PREREQUISITES TO DEMONSTRATION AND TRAINING

.1 Testing, adjusting, and balancing has been performed in accordance with Contract Documents.

.2 Equipment and systems are fully operational.

.3 Copy of completed operation and maintenance manual is available for use in demonstration and training.

.4 Conditions for demonstration and training comply with requirements specified in technical Specifications.

1.4 DEMONSTRATION AND TRAINING

.1 Demonstrate start-up, operation, control, adjustment, trouble-shooting, servicing, and maintenance of each item of equipment and system.

.2 Review operation and maintenance manual in detail to explain all aspects of operation and maintenance.

.3 Prepare and insert additional information in operation and maintenance manual if required.

1.5 INSTRUCTION TO THE CITY'S PERSONNEL

.1 In addition to start-up supervision and instruction to The City's personnel required of individual equipment manufacturers and systems noted, instruct The City's personnel in operation and maintenance of all equipment and systems.

.2 Review instructions with The City's representative to ensure a thorough understanding of equipment and its operation.

.3 Submit to the Contract Administrator a copy of written documentation that instruction has been provided, signed by the City's representative.

END OF SECTION

Part 1 GENERAL

1.1 RELATED WORK

.1 Asbestos abatement

.2 Mechanical and electrical – Services removal

.3 Reconstruction by trades affected

1.2 REFERENCE STANDARDS

.1 Canadian Standards Association (CSA)

.1 CSA-S350-M1980 (R2003) – Code of Practice for Safety in Demolition of Structures

.2 Carry out demolition Work in accordance with standard safety practice and applicable laws and codes.

1.3 EXAMINATION

.1 Carefully examine drawings and site conditions to determine the full extent of demolition and renovation Work to be performed and materials and conditions encountered.

1.4 EXISTING CONDITIONS

.1 Take over elements to be demolished generally based on their condition during the Bid Period.

.2 Part of the existing building will be in operation during the period that Work is in progress. Cooperate with Contract Administrator so as to cause the least inconvenience and carry out all Work to maintain a suitable environment.

.3 Do not remove from the building, without the consent of the Contract Administrator, any of the Contract Administrator's furniture, equipment, tools, or non-building components.

.4 The Contract Administrator will remove all loose furniture and portable equipment required to give free working space as required.

.5 Prevent damage to existing concealed, hidden, poured-in, or buried utilities, service lines, structural rebar, conduits, cables or mechanical equipment in or under the floor slab. Carry out all investigation necessary to confirm location of such utilities, service lines, structural rebar, conduits, cables or mechanical equipment, which may or may not include scanning the floor. Repair to existing utilities, service lines, structural rebar, conduits, cables or mechanical equipment damaged during the course of the work is the responsibility of the Contractor and at the Contractor's expense.

.6 Arrange and pay for disconnecting, removing and capping utility services within areas of demolition as required. Notify affected utility company prior to commencing.

.7 Place markers to indicate location of disconnected services. Identify service lines and capping locations on Record drawings.

.8 Demolition of asbestos containing materials (ACM) and mould contaminated components (MCC) can be hazardous to health. Should material resembling ACM or MCC be encountered in the course of demolition Work, stop Work, and notify Contract Administrator immediately. Do not proceed until written instructions have been received from the Contract Administrator. Refer to Section 02 41 20 Existing Asbestos Assessment Survey.

1.5 DEMOLITION INFORMATION

.1 Where required by authorities having jurisdiction, submit for approval, drawings, diagrams, or details showing sequence of disassembly Work, supporting structures and underpinning.

.2 Provide information in form set out by authorities having jurisdiction, including stamp of qualified professional engineer registered in the Province of Manitoba.

1.6 PROTECTION

.1 Do not interfere with the use of adjacent building areas. Maintain free and safe passage to and from.

.2 Prevent movement or settlement of structures. Provide and place bracing or shoring and be responsible for safety and structure. Be liable for any such movement or settlement and any damage or injury caused.

.3 If safety of structure appears to be endangered, cease operations, and notify the Contract Administrator immediately. Take all precautions to properly support structure. Do not resume operations until acceptable to the Contract Administrator.

.4 Erect access resistant and weatherproof enclosures as required to close-off exterior openings. Maintain exit requirements.

.5 Erect and maintain dustproof partitions as required to prevent spread of dust, fumes and smoke to other parts of the building. Provide plastic tarps to protect furniture, fixed millwork, and bookcases, from dust and debris. On completion, remove partitions and tarps, and make good damaged surfaces to match adjacent surfaces.

.6 Prevent dust from entering the air handling system. Inspect air filters and clean or replace during period system is in use, and prior to turnover.

.7 Prevent debris from blocking surface drainage inlets and systems, or mechanical and electrical systems, which must remain in operation.

.8 During the removal of the existing building elements, provide proper protection from falling objects.

.9 Post warning signs, which are clearly visible.

.10 Carry out demolition Work in a manner to cause minimal inconvenience to the adjacent occupied areas.

Part 2 PRODUCTS

NOT USED.

Part 3 EXECUTION

3.1 DEMOLITION

.1 Perform demolition of existing Work necessary to accommodate new and remedial Work indicated on the drawings, and/or described in the specifications. This shall include all necessary demolition Work and all miscellaneous cutting required for the installation or extension of services.

.2 Repair all demolition in excess of that indicated or required, to the approval of the Contract Administrator, at no cost to the Contract Administrator.

.3 Remove existing construction, millwork, fixtures, equipment, services, and obstacles where required for new Work, refinishing, or making good of existing surfaces, and replace same as Work progresses.

.4 At the end of each days Work leave building, site and Work in a safe condition. Protect interiors or parts not to be demolished from exterior elements.

.5 Demolish to minimize dusting. Keep materials wetted, as directed by the Contract Administrator.

3.2 RENOVATION

.1 Carefully remove, store, protect and reinstall in building, using qualified tradesmen, materials and equipment as required.

.2 Patch and make good existing surfaces to provide neat, uniform finish.

.3 Patch and make good existing surfaces to match existing adjacent Work. Leave finished, neat, to Contract Administrator’s approval.

.4 Patch surfaces with materials similar to existing, to maintain fire and acoustic ratings, and structural integrity.

.5 Neatly perform patching Work to blend smoothly with surrounding surfaces.

.6 Where existing finishes or materials are demolished to carry out the work required in the contract, the demolition shall be patched to match existing.

3.3 DISPOSAL

.1 Dispose of demolished materials, except where noted otherwise, in accordance with local authorities have jurisdiction.

.2 Selling or burning materials on site is not permitted.

.3 Remove contaminated or dangerous materials from worksite, and dispose of in safe manner to minimize danger at site and during disposal.

.4 Deliver all refuse materials to a registered landfill site and pay all costs of disposal.

.5 Employ rodent and vermin exterminators as required to comply with health regulation.

.6 Leave site in condition acceptable to the Contract Administrator.

END OF SECTION

Part 1 GENERAL

1.1 REFERENCES

.1 ASTM International

.1 ASTM C 919, Standard Practice for Use of Sealants in Acoustical Applications.

.2 Canadian General Standards Board (CGSB)

.1 CGSB 19-GP-5M, Sealing Compound, One Component, Acrylic Base, Solvent Curing
.2 CAN/CGSB-19.13, Sealing Compound, One Component, Elastomeric, Chemical Curing
.3 CGSB 19-GP-14M, Sealing Compound, One Component, Butyl-Polyisobutylene Polymer Base, Solvent Curing
.4 CAN/CGSB-19.17, One Component Acrylic Emulsion Base Sealing Compound
.5 CAN/CGSB-19.24, Multi component, Chemical-Curing Sealing Compound

1.2 ACTION AND INFORMATIONAL SUBMITTALS

.1 Submit in accordance with Section 21 05 01 General Provisions – Mechanical.

.2 Product Data:

.1 Submit manufacturer's instructions, printed product literature and data sheets for joint sealants and include product characteristics, performance criteria, physical size, finish and limitations.
.2 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 Manufacturer's Instructions:

.1 Submit instructions to include installation instructions for each product used.

1.3 DELIVERY, STORAGE AND HANDLING

.1 Deliver all materials to the job site in their original unopened containers, with all labels intact.

.2 Store materials in strict accordance with manufacturer’s recommendations.

1.4 SITE CONDITIONS

.1 Ambient Conditions:

.1 Proceed with installation of joint sealants only when:

.1 Ambient and substrate temperature conditions are within limits permitted by joint sealant manufacturer or are above 4.4 degrees C.

.2 Joint substrates are dry.

.3 Conform to manufacturer's recommended temperatures, relative humidity, and substrate moisture content for application and curing of sealants including special conditions governing use.

.2 Joint-Width Conditions:

.1 Proceed with installation of joint sealants only where joint widths are more than those allowed by joint sealant manufacturer for applications indicated.

.3 Joint-Substrate Conditions:

.1 Proceed with installation of joint sealants only after contaminants capable of interfering with adhesion are removed from joint substrates.

1.5 ENVIRONMENTAL CONDITIONS

.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 Health Canada.

1.6 QUALIFICATIONS

.1 Installation of sealant and caulking Work shall be carried out by a recognized specialized applicator having skilled mechanics, thoroughly trained and competent in all phases of caulking Work, with at least five (5) years experience.

1.7 WARRANTY

.1 Contractor hereby warrants that caulking Work will not leak, crack, crumble, melt, shrink, run, lose adhesion or stain adjacent surfaces in accordance with GC 12.3, Warranty, but for three (3) years.

Part 2 PRODUCTS

2.1 MATERIALS

.1 Primers: type recommended by sealant manufacturer.

.2 Joint fillers (for use with sealants):

.1 General: compatible with primer and sealants, outsized 30% to 50%

.2 Polyethylene, urethane, neoprene or vinyl: extruded closed cell foam, Shore A hardness 20, tensile strength 140kPa to 200kPa

.3 Neoprene or butyl rubber: round solid rod, Shore A hardness 70

.4 Polyvinyl chloride or neoprene: extruded tubing with 6mm (1/4") minimum thick walls

.3 Bond breaker: pressure sensitive plastic tape, which will not bond to sealants.

.4 Sealants – exterior: Dow Corning 790 Silicone Building Sealant, or G.E. Silpruf SCS2000. Use at all exterior locations, except where another type is specified. Colour to be selected.

.5 Sealants – interior: paintable silicone: Dow Corning 8644 or G.E. Acrylasil 1302 to interior joints between door and window frame and adjacent construction, translucent silicone to plastic laminate counters and backsplashes. Use at all interior locations except where another type is specified.

.6 Cleaning material for surfaces to receive sealant: Xylol, Methylethyleketon (MEK), Toluol, or as recommended by the manufacturer of sealant.

.7 Energy sealant: foam-in-place urethane. Acceptable products: Polycel One as manufactured by W.R. Grace and Co. or Insta-Seal by Insta-Foam Products, Inc.

Part 3 EXECUTION

3.1 EXAMINATION

.1 Verify at the site that joints and surfaces have been provided as specified under the Work of other Sections; and that joint conditions will not adversely affect execution, performance or quality of completed Work; and that they can put into acceptable condition by means of preparation specified in this Section.

.2 Ascertain that sealers and coatings applied to sealant substrates are compatible with sealant used and that full bond between the sealant and substrate is attained. Request samples of the sealed or coated substrate from their fabricators for testing of compatibility and bond, if necessary, or test on site to Contract Administrator's acceptance.

.3 Verify that specified environmental conditions are ensured before commencing Work.

.4 Ensure that releasing agents, coatings or other treatments have either not been applied to joint surfaces, or that they are entirely removed.

.5 Defective Work resulting from application to unsatisfactory joint conditions will be considered the responsibility of those performing the Work of this Section.

3.2 PREPARATION

.1 Remove dust, paint, loose mortar and other foreign matter, and dry joint surfaces.

.2 Remove rust, silt, scale and coatings from ferrous metals by wire brush, grinding or sandblasting.

.3 Remove oil, grease and other coatings from non-ferrous metals with Xylol, Toluol or MEK.

.4 Prepare concrete, masonry, glazed and vitreous surfaces as recommended by sealant manufacturer.

.5 Examine joint sizes and correct to achieve proper width/depth ratio:

.1 6mm x 6mm (1/4" x 1/4") – minimum joint size
.2 6mm to 13mm (1/4" to 1/2") – depth shall equal width
.3 13mm to 25mm (1/2" to 1") – depth shall equal half of width
.4 25mm to 50mm (1" to 2") – maximum sealant depth to be 13mm (1/2")
.5 For joints wider than 50mm (2"), the sealant manufacturer's representative shall be contacted.

.6 Install joint-filler or apply bond breaker tape to achieve correct joint depth.

.7 Where necessary to prevent staining, mask adjacent surfaces with tape prior to priming and/or caulking.

.8 Prime sides of joint in accordance with manufacturer's directions, immediately prior to caulking.

.9 Before any sealing is commenced, a test of the material shall be made for indications of staining or poor adhesion.

3.3 APPLICATION SEALANTS

.1 Apply sealants in accordance with manufacturer's directions, using a gun with proper size nozzle. Use sufficient pressure to fill voids and joints solid.

.2 Form surface of the sealant with full bead, smooth, free from ridges, wrinkles, sags and droppings using recommended cleaners as Work progresses. Remove masking tape immediately after tooling of joints.

.3 Superficial pointing with the skin bead is not acceptable.

3.4 APPLICATION ENERGY SEALANT

.1 Apply foamed-in-place sealant in strict accordance with manufacturer's specifications.

.2 Apply to fill gaps in insulation and to prevent infiltration at exterior insulation envelope to maintain air/vapour barrier and insulation envelope.

.3 Apply foam at:

.1 Plumbing pipe, electrical and duct penetrations

3.5 SCHEDULE

.1 Examine drawings and specification details.

.2 Sealing not specified elsewhere shall be the following:

.1 Joints between dissimilar materials

.2 Sealing at exposed beads where gypsum board meets dissimilar materials
.3 Remedial sealing on interior, only where authorized

.3 Sealing at base of door frames to flooring, except at carpet.

END OF SECTION

Part 1 GENERAL

1.1 SECTION INCLUDES

.1 Hollow metal steel frames.

.2 Pressed steel doors.

1.2 RELATED SECTIONS

.1 Section 07 92 00 – Joint Sealants.

.2 Section 08 71 00 - Door Hardware – Common Requirements

.3 Section 09 91 99 – Painting for Minor Works.

1.3 REFERENCES

.1 ASTM A653/A653M-09 - Steel Sheet, Zinc-Coated (Galvanized).

.2 ASTM C553-08 - Mineral Fiber Blanket Thermal Insulation for Commercial and Industrial Applications.

.3 ASTM C578-09e1 - Rigid, Cellular Polystyrene Thermal Insulation.

.4 ASTM C591-09 - Unfaced Preformed Rigid Cellular Polyisocyanurate Thermal Insulation.

.5 ASTM C665-06 - Mineral-Fiber Blanket Thermal Insulation for Light Frame Construction and Manufactured Housing.

.6 ASTM C1289-08e1 - Faced Rigid Cellular Polyisocyanurate Thermal Insulation Board.

.7 ASTM E90-09 - Test Method for Laboratory Measurement of Airborne Sound Transmission Loss of Building Partitions and Elements.

.8 ASTM E413-04 - Classification for Rating Sound Insulation

.9 CAN/ULC S104-10 - Standard Method for Fire Tests of Door Assemblies.

.10 CAN/ULC S105-09 - Standard Specification for Fire Door Frames Meeting the Performance Required by CAN/ULC-S104.

.11 CAN/ULC-S704-03 - Thermal Insulation, Polyurethane and Polyisocyanurate Boards, Faced.

.12 CAN/CSA-G40.20-04/G40.21-04 (R2009) - General Requirements for Rolled or Welded Structural Quality Steel/Structural Quality Steel.

.13 CSA-W59-03 (R2008) - Welded Steel Construction (Metal Arc Welding).

.14 CSDMA (Canadian Steel Door Manufacturers Association)

.1 Recommended Dimensional Standards for Commercial Steel Doors and Frames, 2000.
.2 Selection and Usage Guide for Commercial Steel Doors and Frames, 2009.

.15 DHI (Door Hardware Institute) - The Installation of Commercial Steel Doors and Steel Frames, Insulated Steel Doors in Wood Frames and Builder's Hardware.

.16 NFPA 80 - Fire Doors and Fire Windows (2010 Edition).

.17 NFPA 252-2008 - Methods of Fire Tests of Door Assemblies.

1.4 ADMINISTRATIVE REQUIREMENTS

.1 Coordination:

.1 Coordinate with other work having a direct bearing on work of this section.
.2 Coordinate the work with frame opening construction, door, and hardware installation.

.2 Sequencing: Sequence installation to ensure wire connections are achieved in an orderly and expeditious manner.

1.5 SUBMITTALS FOR REVIEW

.1 Section 01 33 00: Submittal Procedures.

.2 Product Data: Indicate door and frame configurations and finishes, location of cut-outs for hardware reinforcement.

.3 Shop Drawings:

.1 Indicate frame elevations, reinforcement, anchor types and spacing, location of cut-outs for hardware, and finish.
.2 Indicate door elevations, internal reinforcement, closure method, and cut-outs for glazing, finishes, and hardware.

1.6 CLOSEOUT SUBMITTALS

.1 Section 01 78 10: Closeout Submittals.

1.7 QUALITY ASSURANCE

.1 Products of This Section: Manufactured to ISO 9000 certification requirements.

.2 Conform to requirements of CSDMA. Maintain one (1) copy of document on Site.

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

1.8 REGULATORY REQUIREMENTS

.1 Fire Rated Door and Frame Construction: Labelled and listed to CAN4-S104 and NFPA 252.

.2 Installed Door and Frame Assembly: Conform to NFPA 80 for fire rated class as scheduled.

1.9 DELIVERY, STORAGE, AND PROTECTION

.1 Refer to Section 01 61 00.

.2 Remove doors and frames from wrappings or coverings upon receipt on Site and inspect for damage.

.3 Store in vertical position, spaced with blocking to permit air circulation between components.

.4 Store materials on planks or dunnage, out of water and covered to protect from damage.

.5 Clean and touch up scratches or disfigurement caused by shipping or handling with zinc-rich primer.

Part 2 PRODUCTS

2.1 MATERIALS

.1 Acceptable Materials

.1 Steel doors and frame product manufactured in accordance with this Specification by CSDMA members, are eligible for use on this project.

.2 Steel

.1 Commercial grade steel to ASTM A653, CS, Type B, Coating Designation ZF75 (A25) minimum. Minimum steel thicknesses shall be in accordance with Appendix 1 of the CSDMA, "Recommended Specifications for Commercial Steel Door and Frame Products".

.3 Door Core Materials

.1 Polystyrene Rigid extruded fire retardant, closed cell board. Density; 16 to 32 kg/m3 (1 to 2 pcf), thermal values; RSI 1.0 (R 6.0) minimum, Type 1, in accordance with ASTM C578.

.4 Primers

.1 Rust inhibitive touch-up only.

.5 Miscellaneous

.1 Door Silencers

.1 Single stud rubber/neoprene type.

.2 Exterior Top Caps

.1 Rigid polyvinylchloride extrusion conforming to CGSB 41-GP-19MA.

.3 Frame Thermal Breaks

.1 Rigid polyvinylchloride extrusion conforming to CGSB 41-GP-19MA.

2.2 FABRICATION - FRAME PRODUCTS

.1 General

.1 Frame product shall be 14 gauge. Frames shall be welded type construction, thermally broken.

.2 Frame product shall be mortised, blanked, reinforced, drilled and tapped at the factory for templated hardware only, in accordance with the approved hardware schedule and templates provided by the hardware supplier.

.3 Mortised cutouts shall be protected with steel guard boxes.

.4 Frame product shall be reinforced only, where required, for surface mounted hardware, anchor hinges, thrust pivots, pivot reinforced hinges, or non-templated hardware. Drilling and tapping is by others, on site, at time of installation.

.5 Provide anchorage appropriate to floor, wall and frame construction. Each wall anchor shall be located immediately above or below each hinge reinforcement on the hinge jamb and directly opposite on the strike jamb. For rebate opening heights up to and including 1520 mm (60") provide two (2) anchors, and an additional anchor for each additional 760 mm (30") of height or fraction thereof, except as indicated below. Frames in previously placed concrete, masonry or structural steel shall be provided with anchors located not more than 150 mm (6") from the top and bottom of each jamb, and intermediate anchors at 660 mm (26") on centre maximum. Fasteners for such anchors shall be provided by others.

.6 Minimum reinforcing, anchor and other component gauges shall be in accordance with Table 1 of the CSDMA, "Recommended Specifications for Commercial Steel Door and Frame Products".

.7 Each door opening shall be prepared for single stud rubber door silencers, three (3) for single door openings, two (2) for double door openings, except on gasketed frame product.

.8 Provide factory-applied touch up primer at areas where zinc coating has been removed during fabrication.

.2 Welded Type

.1 Frame product shall be accurately mitered or mechanically jointed.

.2 As defined in Appendix 2 of the CSDMA, "Recommended Specifications for Commercial Steel Door and Frame Products", frame product perimeter corner joints shall be:

.1 Profile welded; punch-mitered - continuously welded on the profile faces, rabbets, returns and soffit intersections, or saw-mitered - continuously welded on the profile faces, rabbets, returns, stops and soffit intersections. Punch or saw-mitered, at the manufacturer's discretion. All profile welded frame product exposed faces shall be filled and ground to a smooth, uniform, seamless surface.

.3 Joints at mullions, sills and center rails shall:

.1 Be coped accurately, butted and tightly fitted.

.2 At intersecting flush profile faces, be securely welded, filled and ground to a smooth, uniform, seamless surface.

.3 At intersecting recessed profile faces, be securely welded to concealed reinforcements, with exposed hairline face seams.

.4 At all other intersecting profile elements, have exposed hairline face seams.

.4 Welding shall conform to CSA W59.

.5 Where frame product is to be installed prior to the adjacent partition, a floor anchor shall be securely attached to the inside of each jamb profile. Each floor anchor shall be provided with two (2) holes for securing to the floor. For conditions that do not permit the use of a floor anchor, an additional wall anchor, located within 150 mm (6") of the base of the jamb, shall be substituted.

.6 Weld in two (2) temporary jamb spreaders per door opening to maintain proper alignment during shipment and handling, which shall not be used for installation.

.7 Glazing stops shall be formed steel channel, minimum 16 mm (0.625") height, accurately fitted, butted at corners and fastened to frame sections with counter-sunk oval head sheet metal screws.

.8 When required due to site access, when advised by the Contractor responsible for coordination or installation, as specified on the drawings or due to shipping limitations, frame product for large openings shall be fabricated in sections as designated on the approved submittal drawings, with splice joints for field assembly and welding by others.

.9 Prior to shipment, mark each frame product with an identification number as shown on the approved submittal drawings.

2.3 FABRICATION – DOORS

.1 General

.1 Doors shall be laminated core construction.

.2 Longitudinal edges shall be mechanically interlocked, tack welded at top and bottom of door, above and below each edge cutout and at 150 mm (6") on center with visible edge seams.

.3 Doors shall be mortised, blanked, reinforced, drilled and tapped at the factory for templated hardware only, in accordance with the approved hardware schedule and templates provided by the hardware supplier.

.4 Holes 12.7 mm (0.5") diameter and larger shall be factory prepared, except mounting and through-bolt holes, which are by others, on site, at time of hardware installation. Holes less than 12.7 mm (0.5") diameter shall be factory prepared only when required for the function of the device (for knob, lever, cylinder, thumb or turn pieces) or when these holes over-lap function holes.

.5 Doors shall be reinforced only, where required, for surface mounted hardware, anchor hinges, thrust pivots, pivot reinforced hinges, or non-

templated hardware. Drilling and tapping is by others, on site, at time of installation.

.6 Top and bottom of doors shall be provided with inverted, recessed, welded steel channels. Exterior doors, and where otherwise scheduled, shall be provided with flush steel top caps.

.7 Minimum reinforcing and component gauges shall be in accordance with Table 1 of the CSDMA, "Recommended Specifications for Commercial Steel Door and Frame Products".

.8 Provide factory-applied touch-up primer at areas where zinc coating has been removed during fabrication.

.9 Prior to shipment, mark each door with an identification number as shown on the approved submittal drawings.

.2 Laminated Core Construction

.1 Both face sheets for doors shall be formed from a sheet of 14 gauge steel with polystyrene core, laminated under pressure to face sheets.

2.4 ADHESIVES

.1 Cores and Steel Components: Heat resistant, structural reinforced epoxy, resin based adhesive.

.2 Lock Seam: Reinforced epoxy resin, high viscosity, thicksotroptic sealant.

2.5 DOOR SCHEDULE

.1 Supply and install new threshold. Contractor to field confirm dimensions of door.

.2 Door

.1	Type:	A
.2	Material:	Hollow Metal
.3	Core:	Insulated
.4	Finish:	Painted
.5	Glass:	-

.3 Frame

.1	Type:	Hollow Metal
.2	Material:	Welded Steel Frame
.3	Finish:	Painted
.4	Glass:	-

.4 ULC Rating: 1-hour

.5 Hardware

.1	Group:	1
.2	Description:	Mechanical Room Lockset

Part 3 EXECUTION

3.1 EXAMINATION

.1 Verify that opening sizes and tolerances are acceptable; check floor area within path of door swing for flatness.

.2 Verify doors and frames are correct size, swing, rating and opening number.

.3 Remove temporary shipping spreaders.

3.2 INSTALLATION

.1 Install doors and frames to CSDMA.

.2 Install fire-rated doors and frames in accordance with NFPA 80, and local authority having jurisdiction.

.3 Coordinate with masonry, gypsum board and concrete wall construction for anchor placement and throat depths.

.4 Coordinate installation of doors and frames with installation of hardware and view holes specified in Section 08 71 00.

.5 Set frames plumb, square, level and at correct elevation.

.6 Secure anchorages and connections to adjacent construction.

.7 Brace frames rigidly in position while building-in. Install wood spreaders at third points of frame rebate height to maintain frame width. Provide vertical support at centre of head for openings exceeding 1 200 mm (48 inches) in width.

.8 Remove wood spreaders after frames have been built-in.

.9 Make allowance for deflection to ensure structural loads are not transmitted to frame product.

.10 Install doors, and hardware in accordance with hardware templates and manufacturer's instructions.

.11 Adjust operable parts for correct clearances and function.

.12 Install door silencers.

.13 Finish paint as specified in Section 09 91 99.

.14 Install roll formed steel reinforcement channels between two abutting frames. Anchor to structure and floor.

3.3 ERECTION TOLERANCES

.1 Section 01 73 00: Execution Requirements.

.2 Maximum Diagonal Distortion: 1.5 mm (1/16 inch) measured with straight edges, crossed corner to corner.

3.4 SCHEDULE

.1 Refer to Door Schedule Section 08 71 00 and on Drawings.

END OF SECTION

1.1 SECTION INCLUDES

.1 Hardware for hollow metal doors.

1.2 REFERENCES

.1 American National Standards Institute (ANSI) / Builders Hardware Manufacturers Association (BHMA)

.1 ANSI/BHMA A156.1, American National Standard for Butts and Hinges.
.2 ANSI/BHMA A156.2, Bored and Preassembled Locks and Latches.
.3 ANSI/BHMA A156.3, Exit Devices.
.4 ANSI/BHMA A156.4, Door Controls – Closers.
.5 ANSI/BHMA A156.5, Auxiliary Locks and Associated Products.
.6 ANSI/BHMA A156.6, Architectural Door Trim.
.7 ANSI/BHMA A156.8, Door Controls - Overhead Stops and Holders.
.8 ANSI/BHMA A156.10, Power Operated Pedestrian Doors.
.9 ANSI/BHMA A156.12, Interconnected Locks and Latches.
.10 ANSI/BHMA A156.13, Mortise Locks and Latches Series 1000.
.11 ANSI/BHMA A156.14, Sliding and Folding Door Hardware.
.12 ANSI/BHMA A156.15, Release Devices - Closer Holder, Electromagnetic and Electromechanical.
.13 ANSI/BHMA A156.16, Auxiliary Hardware.
.14 ANSI/BHMA A156.17, Self-closing Hinges and Pivots.
.15 ANSI/BHMA A156.18, Materials and Finishes.
.16 ANSI/BHMA A156.19, Power Assist and Low Energy Power - Operated Doors.
.17 ANSI/BHMA A156.20, Strap and Tee Hinges and Hasps.

.2 Canadian Steel Door and Frame Manufacturers' Association (CSDMA)

.1 CSDMA Recommended Dimensional Standards for Commercial Steel Doors and Frames.

.3 Standards Council of Canada (SCC) / Underwriters Laboratories of Canada (ULC)

.1 CAN/ULC-S104, Method for Fire Tests of Door Assemblies.
.2 CAN/ULC-S132, Emergency Exit and Emergency Fire Exit Hardware.
.3 CAN/ULC-C305, Panic Hardware

.4 Door and Hardware Institute Canada (DHI)

.1 AHC and EHC certification programs.
.2 A115 series.
.3 WDHS.3 - Hardware Locations for Wood Flush Doors.

.5 Builders Hardware Manufacturers Association (BMHA)

.1 A156 series.

.6 National Fire Protection Agency

.1 NFPA 80 - Fire Doors, Fire Windows.

.2 NFPA 252 - Fire Tests of Door Assemblies.

1.3 ADMINISTRATIVE REQUIREMENTS

.1 Coordination: Coordinate with other work having a direct bearing on work of this section.

.1 Coordinate the work with other directly affected sections involving manufacture or fabrication of internal reinforcement for door hardware and recessed items.

.2 Coordinate City of Winnipeg's keying requirements during the course of the Work.

.2 Sequencing: Sequence installation to ensure utility connections are achieved in an orderly and expeditious manner.

1.4 SUBMITTALS FOR REVIEW

.1 Section 01 33 00: Submittal Procedures.

.2 Shop Drawings:

.1 Indicate locations and mounting heights of each type of hardware, schedules, catalogue cuts, electrical characteristics and connection requirements, including make, model, material, function, finish, and all other pertinent information for each door or pair of doors. Use standard typed hardware list. "Horizontal" list not permitted.

.3 Samples:

.1 Submit one (1) sample of each type hardware specified, when requested by Contract Administrator illustrating style, colour, and finish.

.2 Identify each sample by label indicating applicable specification paragraph number, finish, and hardware package number.

1.5 SUBMITTALS FOR INFORMATION

.1 Section 01 33 00: Submittal Procedures.

.2 Installation Data: Manufacturer's special installation requirements.

1.6 CLOSEOUT SUBMITTALS

.1 Section 01 78 00: Closeout Procedures.

.2 Operation and Maintenance Data: Include data on operating hardware, lubrication requirements, and inspection procedures related to preventative maintenance.

.3 Provide maintenance data, parts list, and manufacturer's instructions for each type door closers, locksets, door holders, and panic hardware for incorporation into maintenance manual.

.4 Brief maintenance staff regarding proper care of hardware such as lubrication of locksets, adjustments of door closers, cleaning, and general maintenance.

.5 Warranty Documentation: Submit manufacturer warranty and ensure forms have been completed in School Division's name and registered with manufacturer.

.6 Record Documentation:

.1 Record actual locations of installed cylinders and their master key code.
.2 Keys: Deliver with identifying tags to School Division direct from hardware supplier.

1.7 MAINTENANCE MATERIAL SUBMITTALS

.1 Tools:

.1 Provide special wrenches and tools applicable to each different or special hardware component.
.2 Provide maintenance tools and accessories supplied by hardware component manufacturer.

1.8 QUALITY ASSURANCE

.1 Products of This Section: Manufactured to ISO 9000 certification requirements.

.2 Perform Work to the following requirements:

.1 BHMA A156 series.
.2 DHI - A115 series.
.3 DHI - WDHS.3.
.4 CSDMA.
.5 NFPA 252.
.6 UL 10B.
.7 UL 305.
.8 ULC S132.
.9 CAN4-S104.

.3 Use ULC listed and labelled hardware for doors in fire separations and exit doors.

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

.5 Installer Qualifications: Company specializing in performing the work of this section with minimum three (3) years documented experience.

1.9 REGULATORY REQUIREMENTS

.1 Conform to applicable code for Products requiring electrical connection. Listed and classified by ULC as suitable for the purpose specified and indicated.

1.10 DELIVERY, STORAGE, AND PROTECTION

.1 Section 01 61 00: Transport, handle, store, and protect products.

.2 Package hardware items individually; label and identify each package with door opening code to match hardware schedule.

1.11 WARRANTY

.1 See Bid Opportunity.

Part 2 PRODUCTS

2.1 SUPPLIERS

.1 Acceptable Suppliers: As indicated in Hardware Schedule.

2.2 MANUFACTURERS

.1 Acceptable Manufacturers: As indicated in Hardware Schedule.

2.3 KEYING

.1 Contractors to supply, install and make use of construction cylinders in all exterior doors. School Division will exchange all construction cylinders at building turnover.

2.4 FINISHES

.1 Finishes: Identified in Schedule at end of section.

Part 3 EXECUTION

3.1 EXAMINATION

.1 Verify that doors and frames are ready to receive work and dimensions are as indicated on Shop Drawings.

.2 Verify that electric power is available to power operated devices and is of the correct characteristics.

3.2 INSTALLATION

.1 Install hardware to manufacturer's written instructions.

.2 Use templates provided by hardware item manufacturer.

.3 Mounting heights for hardware from finished floor to centre line of hardware item.

3.3 ADJUSTING

.1 Adjust hardware for smooth operation.

3.4 PROTECTION OF FINISHED WORK

.1 Do not permit adjacent work to damage hardware or finish.

3.5 SCHEDULES

.1 Refer to Door Hardware Schedule.

END OF SECTION

Hardware Sets

SET #1.0

3	Hinges	IVES	5BB1HW 4 1/2 X 4	629
1	Lockset	SCHLAGE	ND80TD RHO*	626
1	Closer	LCN	4040XP SHCUSH MC	689
1	Kick Plate	IVES	8402 18” x 36” B-CS TKTX	630
1	Floor Stop	IVES	FS444	628
1	Threshold	ZERO	626A-223	A
1	Door Bottom	ZERO	361AA	AA
1	Weatherstrip	ZERO	8144S	BK

Note: *Confirm existing key system with Contract Administrator before ordering locks.

Part 1 GENERAL

1.1 REFERENCES

.1 Master Painters Institute (MPI) Architectural Painting Specifications Manual, current edition

.2 Department of Justice Canada, Canadian Environmental Protection Act (CEPA)

.3 Environmental Protection Agency (EPA) Test Method for Measuring Total Volatile Organic Compound Content of Consumer Products, Method 24 (for surface coatings)

.4 Health Canada/WHMIS, Material Safety Data Sheets (MSDS)

1.2 QUALITY ASSURANCE

.1 Contractor shall have a minimum of five (5) years proven satisfactory experience. When requested, provide a list of the last three (3) comparable projects, including job name and location, specifying authority, and project manager.

.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.

1.3 DELIVERY, STORAGE AND HANDLING

.1 Deliver paint materials in sealed original labelled containers bearing manufacturer's name, type of paint, brand name, colour designations and instructions for mixing and/or reducing.

.2 Remove all damaged, opened and rejected materials from the site.

.3 Observe manufacturer's recommendations for storage and handling.

.4 Comply with requirements of authorities having jurisdiction, in regard to the use, handling, storage and disposal of hazardous materials.

.5 Provide adequate storage facilities. Store paint materials at a minimum ambient temperature of 10°C, and in a well-ventilated area.

.6 Take all precautionary measures to prevent fire hazards and spontaneous combustion.

1.4 ENVIRONMENTAL CONDITIONS

.1 Measure moisture content of surfaces using a calibrated electronic 'Moisture Meter', except test concrete floors for moisture using a simple cover patch test. Do not apply finishes unless the moisture content of surfaces are below the maximums:

.1 Gypsum wallboard: 12%
.2 Interior located wood: 15%

.2 Ensure substrate temperature, and the surrounding air temperature, is above 10°C and below 32°C, before applying finishes, unless indicated otherwise by manufacturer.

.3 Perform no painting when the relative humidity is above 85% or when the dew point is less than 3°C below ambient or surface temperature.

.4 Provide adequate continuous ventilation and sufficient heating facilities to maintain ambient and substrates temperature above 10°C, for 24 hours before, during, and after paint application until paint has cured sufficiently (minimum 48 hours).

.5 Provide minimum 30-foot candles of lighting on surfaces to be finished.

.6 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.

1.5 PROTECTION

.1 Adequately protect other surfaces from paint and damages. Make good any damage as a result of inadequate or unsuitable protection.

.2 Furnish sufficient drop cloths, shields and protective equipment to prevent spray of droppings from fouling surfaces not being painted and, in particular, surfaces within storage and preparation area.

.3 Place cotton waste, cloths, and material, which may constitute a fire hazard in closed metal containers and remove daily from site.

.4 Remove all electrical plates, surface hardware, fittings, and fastenings, prior to painting operations. These items are to be carefully stored, cleaned and replaced on completion of Work in each area. Do not use solvent to clean hardware that may remove the permanent lacquer finish.

Part 2 PRODUCTS

2.1 MATERIALS

.1 Acceptable paint manufacturers:

.1 Cloverdale Paint Inc. – Super Acrylic
.2 General Paint Corp. – Enviroguard

.2 Provide paint materials for paint systems from single manufacturer.

.3 All materials used shall be lead and mercury free and shall have low VOC content where possible.

.4 Linseed oil, shellac and turpentine: highest quality product from approved manufacturer, compatible with other coating materials as required.

.5 Paints to have a good flowing and brushing properties and be capable of drying or curing free of streaks or sags.

2.2 MIXING AND TINTING

.1 Unless otherwise specified herein, all paint shall be ready-mixed and pre-tinted. Re-mix all 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 Paste, powder or catalyzed paint mixers 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 If required, thin paint for spraying in strict accordance with manufacturer's instructions.

Part 3 EXECUTION

3.1 CONDITIONS OF SURFACES

.1 Thoroughly examine all surfaces scheduled to be painted prior to commencement of Work. Report in writing to the Contract Administrator any condition that may potentially affect proper application. Do not commence until all such defects have been corrected.

.2 Be responsible for the condition of surfaces or for correcting defects and deficiencies in the surfaces, which may adversely affect Work of this Section.

3.2 MANUFACTURER'S INSTRUCTIONS

.1 Comply with manufacturer's written recommendations or specifications, including product technical bulletins, handling, storage and installation instructions, and data sheet.

3.3 PREPARATION OF SURFACES

.1 All surfaces shall be prepared as follows:

.1 Remove dust, dirt, and other surface debris by wiping with dry, clean cloths.
.2 Wash surfaces with a biodegradable detergent 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.

.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 pre-treatment as soon as possible after cleaning and before deterioration occurs.

.3 Sand and dust between coats as required to provide adequate adhesion for next coat and to remove defects visible from a distance up to 1000mm (39”).

3.4 APPLICATIONS

.1 Apply paint in a workmanlike manner using skilled and trade qualified applicators.

.2 Apply each coat at the proper consistency.

.3 Each coat of paint is to be slightly darker than the preceding coat, unless otherwise approved by the Contract Administrator.

.4 Unless otherwise approved, apply a minimum of four (4) coats of paint where deep or bright colours are used to achieve satisfactory results.

.5 Sand and dust between each coat to provide an anchor for next coat and to remove defects visible from a distance up to 1000mm (39”).

.6 Do not apply finishes on surfaces that are not sufficiently dry. Unless manufacturer’s directions state otherwise, each coat shall be sufficiently dry and hard before a following coat is applied.

.7 Paint finish shall continue through behind all wall-mounted items (re: white and tack boards).

.8 Where clear finishes are required, ensure tint fillers match wood. Work fillers well into the grain before it has set. Wipe excess from the surface.

.9 Back prime interior woodwork, which is to receive a paint or enamel finish, with enamel undercoater paint.

.10 Back prime interior woodwork, which is to receive stain and/or varnish finish, with a gloss varnish, reduced by 25% with mineral spirits.

.11 Paint tops of low partitions (partitions stopping below ceiling height).

.12 At locations where demolition has exposed previously unpainted surfaces, provide additional base coats so new finish will blend with adjacent painted surfaces.

3.5 MECHANICAL AND ELECTRICAL EQUIPMENT

.1 Prime and paint exposed insulated and bare pipes, conduits, boxes, insulated and bare ducts, hangers, brackets, collars, and supports, except where items are plated or covered with a prefinished cladding. Paint to colours of adjacent walls, ceilings, etc. to Contract Administrator’s direction.

.2 Remove grilles, covers and access panels for mechanical and electrical systems from location and paint separately.

.3 Finish paint primed equipment.

.4 Keep sprinkler heads free of paint.

.5 Replace identification markings on mechanical and electrical equipment when painted over or spattered.

3.6 CLEANING

.1 As the Work proceeds, and upon completion, promptly remove all paint where spilled, splashed, spattered, or sprayed, using means and materials that are not detrimental to affected surfaces.

.2 During the progress of Work, keep premises free from any unnecessary accumulation of tools, equipment, surplus materials and debris.

.3 Remove combustible rubbish materials and empty paint cans each day and safely dispose of same in accordance with requirements of authorities having jurisdiction.

.4 Upon completion of Work, leave premises neat and clean, to the satisfaction of the Contract Administrator.

3.7 SITE TOLERANCES

.1 Painting surfaces shall be considered unacceptable if any of the following are evident under natural lighting source for exterior surfaces and final lighting source (including daylight) for interior surfaces:

.1 Visible defects are evident on vertical surfaces when viewed at normal viewing angles from a distance of not less than 1000mm (39”).
.2 Visible defects are evident on horizontal surfaces when viewed at normal viewing angles from a distance of not less than 1000mm (39”).
.3 Visible defects are evident on ceiling, soffit or other overhead surfaces when viewed at normal viewing angles.
.4 When final coat on any surface exhibits a lack of uniformity of colour, sheen, texture, and hiding across full surface area.

3.8 PAINTING AND FINISHING, AND SCHEDULE

.1 This schedule is furnished as an assistance to the painter and should not be considered as entirely inclusive. Examine drawings and specifications. Determine extent of Work required.

.2 Generally, and not being limited to, the following are items throughout the interior and exterior of building and on the site that shall be painted or treated as part of the Work of this Section:

.1 New hollow metal doors and frames
.2 New exposed ductwork
.3 New conduit
.4 Steel vents and louvres in exposed finished areas

.3 Refer to Mechanical and Electrical drawings and specifications to note new equipment, ductwork, conduit and associated parts, which are to be painted to suit adjacent surfaces.

.4 Finishes specified are intended to cover surfaces satisfactorily when applied in accordance with manufacturer's recommendations.

.5 Interior:

.1 Gypsum board:

.1 One (1) coat latex sealer

.2 Two (2) coats latex, e.s.

.2 Existing painted surfaces:

.1 Two (2) coats latex, e.s.

END OF SECTION

Part 1 GENERAL

1.1 CODES AND STANDARDS

.1 All drawings and all sections of the specifications shall apply to and form an integral part of this section.

.2 Comply with and adhere to all applicable, codes, standards and applicable bylaws of the authority having jurisdiction.

.3 Where there is a conflict between the drawings and specifications and applicable codes or standards or requirements of the authority having jurisdiction the more restrictive condition shall apply.

1.2 SCOPE OF WORK

.1 Refer to front end specifications and adhere to all requirements as specified.

.2 Work to include all labour, material and equipment required for installing, testing and commissioning of mechanical systems as detailed in other sections of Divisions 21 to 23.

.3 All mechanical work to be bid as a single complete sub-Contract even though work of various mechanical trades has been subdivided.

.4 It is the responsibility of the Contractor to co-ordinate the work among the various mechanical sub-trades to ensure complete functioning systems.

1.3 EXISTING CONDITIONS

.1 Examine site, existing adjacent buildings and local conditions affecting work under this Contract. Examine Structural, Architectural, Mechanical and Electrical and all other Contract drawings to ensure work can be performed without changes to the building as shown on drawings. No allowance will be made later for necessary changes, unless notification of interferences have been brought to the Contract Administrator's attention, in writing, prior to closing of tenders.

.2 Ductwork and Duct Components:

.1 The Contractor is advised that detailed site investigations are to be carried out prior to fabrication and construction of duct and duct components; verify the size, orientation, location and supports required for, duct to equipment transitions and new duct to existing duct connections.

.2 Drawings and equipment specifications are based on the best information available at time of Bid Opportunity and are subject to revision based on reviewed shop drawings received during the project submittals process.

.3 Contractors shall include all necessary allowances in their bid price for minor changes that adjust tie-in locations and duct sizes to meet equipment shop drawing requirements and as-found conditions.

.4 The following allowances shall be considered minor and incidental to the price bid. No claims for extra will be considered by the Contract Administrator for modifications required to accommodate these minor changes,

.1 Duct diameter or duct rectangular dimensions, ±50mm,

.2 Tie-in location to existing ductwork, ±3.0 m in all directions,

.3 Duct routing, deviation from duct centreline shown, ±2.0 m in all directions,

.4 Fittings additional to that shown on drawings,

.5 Fittings required to achieve temporary, partial operation of any air moving system in accordance with the stated phased construction implementation schedule.

.3 Plumbing and Piping Systems:

.1 The Contractor is advised that detailed site investigations are to be carried out prior to fabrication and construction of plumbing and piping systems and piping components; verify the size, orientation, location and supports required for, pipe to equipment transitions and new pipe to existing pipe connections.

.2 Drawings and equipment specifications are based on the best information available at time of Bid Opportunity and are subject to revision based on reviewed shop drawings received during the project submittals process.

.3 Contractors shall include all necessary allowances in their bid price for minor changes that adjust tie-in locations and pipe sizes to meet equipment shop drawing requirements and as-found conditions.

.4 The following allowances shall be considered minor and incidental to the price bid. No claims for extra will be considered by the Contract Administrator for modifications required to accommodate these minor changes,

.1 Pipe diameter dimensions, ±40mm,

.2 Tie-in location to existing plumbing and piping, ±3.0 m in all directions,

.3 Pipe routing, deviation from pipe centreline shown, ±3.0 m in all directions,

.4 Pipe fittings additional to that shown on drawings,

.5 Fittings required to achieve temporary, partial operation of any piping system in accordance with the stated phased construction implementation schedule.

.4 The Contractor shall take all steps necessary to make any affected sub-trades of the renovation allowances stated above aware of these allowances and shall enforce these allowances; no Change Orders will be considered for renovation allowances stated above, the decision of the Contract Administrator is final.

1.4 SITE SERVICE INFORMATION

.1 Location, routing and depth of existing mechanical services shown on drawings including sanitary sewers, water mains and other utilities are based on recorded information and are approximate only. Contractor and his sub-trades shall verify exact location at jobsite.

.2 Obtain Contract Administrator approval before commissioning systems and putting into service.

1.5 PERMITS AND REGULATIONS

.1 Obtain all permits and pay all fees for performing the work.

.2 Review drawings with authorities having jurisdiction to ensure compliance with all applicable codes and bylaws.

1.6 EXECUTION OF WORK

.1 Install work in advance of concrete pouring or similar work. Provide and set pipe sleeves and equipment anchors as required.

.2 Install concealed pipes and ducts neatly, close to building structure so furring is minimum size. Pipes, ducts and equipment installed improperly, to be removed and replaced without cost to Contract Administrator.

.3 Protect and maintain work until building has been completed and accepted. Protect work against damage during installation. Cover with tarpaulins if necessary. Repair all damage to floor and wall surfaces resulting from carrying out work, without expense to Contract Administrator.

.4 During welding or soldering ensure structure is protected against fire by shielding, using fire-rated sheets or galvanized iron sheets. Contractor shall provide trained persons armed with suitable type extinguishers, to watch for and extinguish sparks, etc.

.5 Co-ordinate work with other sections to avoid conflict and ensure proper installation of all equipment. Review all Contract drawings.

.6 On completion of work, remove tools, surplus and waste material and leave work in clean, perfect condition.

1.7 WARRANTY

.1 Warranty satisfactory operation of all work and apparatus installed under this Contract. Replace, at no expense to Contract Administrator, all items which fail or prove defective within a period of one year after final acceptance of complete Contract by Contract Administrator, provided such failure is not due to improper usage by Contract Administrator. Make good all damage to building incurred as a result of failure or repair of mechanical work.

.2 No certification given, payment made, partial or entire use of equipment by Contract Administrator, shall be construed as acceptance of defective work or

acceptance of improper materials. Make good at once, without cost to the Contract Administrator all such defective work or materials and consequence resulting there from, within one year of final acceptance date.

.3 This general guarantee shall not act as a waiver for any specified guarantee and/or warranty of greater length of time noted elsewhere in these documents.

1.8 INSPECTIONS

.1 Contractor's work will be inspected periodically by Contract Administrator or their representatives, solely for purpose of determining general quality of work, and not for any other purpose. Inspection and directives given to Contractor does not relieve Contractor and his agents and employees of their responsibility to erect and install work in all its parts in a safe and workmanlike manner, and in accordance with plans and specifications, nor impose upon Contract Administrator or their representatives, any responsibility to supervise or oversee erection or installation of any work.

1.9 MECHANICAL SHOP DRAWINGS

.1 Submit for review no more than six sets of detailed shop drawings for all mechanical equipment noted in other sections of Divisions 21 to 23. Alternately the Contractor may elect to submit shop drawings in PDF file format provided all requirements of clause 1.10 are met.

.2 Check shop drawings for conformity to plans and specifications before submission.

.3 Each drawing shall bear Divisions 21 to 23 stamp with Firm's name, date of review and shall be initialled by the responsible officer of Divisions 21 to 23. Include name of project, equipment supplier and clause number equipment is specified under.

.4 Clearly show division of responsibility. No item, equipment or description of work shall be indicated to be supplied or work to be done "by Other's or by Purchaser". Any item, equipment or description of work shown on shop drawings shall form part of the Contract, unless specifically noted to contrary.

.5 Take full responsibility for securing and verifying field dimensions. In case where fabrication must proceed prior to field dimensions being available, check all shop drawings and approve for dimensions only. In this case guarantee that dimensions will be worked to and ensure that other sub-trades are aware of these dimensions and shall comply with them.

.6 Review by Contract Administrator shall be mutually understood to refer to general design only. If errors in detailed dimensions or interference with work are noticed, attention of Contractor will be called to such error or interferences, but Contract Administrator's review of drawings will not relieve Contractor from responsibility for said error or interferences, or from necessity of furnishing such work, and materials as may be required for completion of work as called for in Contract Documents.

1.10 MECHANICAL SUB-TRADES

.1 State in tender, names of all sub-trades to be used in mechanical work.

.2 Contractor to have minimum five years experience in field of mechanical Contracting and to have successfully performed work of similar nature and approximate size to that indicated in specifications and on drawings. Sub-trades shall employ, on this project, foremen or supervisory personnel who have had similar experience to that required by the Contractor.

1.11 MECHANICAL DESIGNATED TRADES

.1 All works by the Mechanical Contractor, and any Sub-Contractors, in a designated trade as regulated by The Apprenticeship and Certification Act shall be supervised by personnel with a Certificate of Qualification from the Province of Manitoba in that designated trade.

.2 Mechanical Contractor, and any Sub-Contractors, shall provide proof of Certificate of Qualification at the request of the Contract Administrator.

1.12 OPERATING AND MAINTENANCE MANUALS

.1 Provide operation and maintenance data for incorporation into O&M manuals.

.2 Draft operation and maintenance manual to be approved by, and final copies deposited with, Contract Administrator before final inspection.

.3 General:

- .1 Include a title page bearing the name of the project, The CIty, and installing Contractor.
- .2 Table of contents.
- .3 List of sub-Contractors, identifying the scope of work they completed on the project.
- .4 List of equipment/material suppliers, identifying the equipment/materials they provided.

.4 Project documentation to include:

- .1 Installer's warranty certificate.
- .2 Copy of permits issued by Authority having Jurisdiction.
- .3 Copy of approvals and proof of inspections from Authority having Jurisdiction.
- .4 Copy of material and systems tests including balancing report, fire damper test report, water treatment results, pressure tests, etc.
- .5 Copy of approved equipment and material shop drawings.

.5 Operation data to include:

- .1 Control schematics for each system.
- .2 Description of each system and its controls for control systems not provided by the Contract Administrator's control Contractor.

.3 Description of operation of each system at various loads together with reset schedules and seasonal variances.
.4 Operation instruction for each system and each component.
.5 Description of actions to be taken in event of equipment failure.
.6 Valve schedule and flow diagram.
.7 Colour coding chart.

.6 Maintenance data shall include:

.1 Servicing, maintenance, operation and trouble-shooting instructions for each item of equipment.
.2 Data to include schedules of tasks, frequency, and tools required and task time.

.7 Performance data to include:

.1 Equipment manufacturer's performance data sheets with point of operation as left after commissioning is complete.
.2 Equipment performance verification test results.
.3 Special performance data as specified elsewhere.

.8 Additional Data:

.1 Prepare and insert into operation and maintenance manual additional data when need for it becomes apparent during specified demonstrations and instructions

.9 Approvals:

.1 Submit two (2) copies of draft Operation and Maintenance Manual to Contract Administrator for approval. Submission of individual data will not be accepted unless so directed by Contract Administrator.
.2 Bind data in 3-ring binder with indexed tabs, table of contents, and contact personnel for Contractors, sub-Contractors, vendors and suppliers, and repair and maintenance.
.3 Make changes requested by Contract Administrator and resubmit (3) final copies and a flash drives including the PDF file of the bound O&M manual.

1.13 DRAWINGS

.1 Drawings are diagrammatic only and do not show all details. Information involving accurate measurements of building to be taken from Architectural Drawings and/or at the building. Make without additional expense to Contract Administrator, all necessary changes or additions to runs to accommodate structure conditions. Locations of pipes, ducts and other equipment to be altered without charge to Contract Administrator, provided change is made before installation and does not necessitate additional materials and that Contract Administrator ratifies all such changes and recorded on Record Set of Drawings.

.2 Drawings and specifications to be considered as an integral part of Contract Documents. Neither drawings nor specifications to be used alone. Misinterpretation of requirements of plans or specifications shall not relieve

Contractor of responsibility of properly completing work to approval of Contract Administrator.

.3 It is the Contractor's responsibility to ensure that all sub-Contractors and suppliers are aware of and conform to all Contract requirements indicated on both the drawings and specifications.

.4 As work progresses, and before installing piping, ductwork, fixtures and equipment interfering with interior treatment and use of building, consult Contract Administrator for comments. This applies to all levels and proper grading of piping. If Contractor fails to perform above checking and fails to inform Contract Administrator of such interference, Contractor to bear all subsequent expense to make good the installation.

.5 Drawings indicate general location and route to be followed by pipes and ducts. Where required piping is not shown on plans or only shown diagrammatically, install in such a way as to conserve headroom and interfere as little as possible with free use or space through which they pass.

.6 Refer to Architectural Drawings for roof construction details. These shall relate to roof supports, piping penetrating roofs, etc. as indicated on the mechanical drawings.

1.14 MATERIALS – EQUALS AND ALTERNATES

.1 Acceptable manufacturers of specified materials and equipment are named in this specification for the purpose of establishing the standard of materials and workmanship to which Contractor shall adhere. The tender price shall be based on the use of materials and equipment as specified.

.2 Materials of same general type are to be from the same manufacture (eg: all air supply units shall be same manufacturer). The Contractor shall ensure that all sub-trades provide products of same manufacturer.

.3 Equipment listed as "equal" in specifications or submitted as alternate by Contractor must meet all space requirements, specified capacities and must have equipment characteristics of specified equipment as interpreted by Contract Administrator. Install equipment in strict accordance with manufacturer's published recommendations. Any variations to installation, additional work required or additional equipment required to meet the specified and designed drawing of the "equal" equipment that is not required for the specified product shall be the responsibility of the Contractor and/or supplier.

.4 Equipment and material shown on drawings and not specified herein, or specified herein and not shown on drawings, shall be included in this Contract as though both shown and specified.

1.15 EQUIPMENT INSTALLATION

.1 Unions or flanges: provide for ease of maintenance and disassembly.

.2 Space for servicing, disassembly and removal of equipment and components: provided as recommended by manufacturer or as indicated.

.3 Equipment drains/Relief Valves: pipe to floor drains, minimum drain size NPS 1 complete with tees and cleanouts for easy cleaning.

.4 Contractor responsible for coordination with Contract Administrator for final equipment locations.

.5 Relocate equipment as indicated on the drawings. Be fully responsible for damage to equipment until accepted by the Contract Administrator at project completion.

1.16 PROTECTION OF OPENINGS

.1 Protect equipment and systems openings from dirt, dust, and other foreign materials with materials appropriate to system.

1.17 CONCEALMENT OF PIPING

.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 Contract Administrator if there is a contradictory situation. Install as directed.

1.18 SAMPLES

.1 Submit for Contract Administrators review such standard manufacturer's samples as the Contract Administrator may reasonably require.

.2 Submit samples as for procedures describing shop drawings, with reasonable promptness and in an orderly sequence, so as to cause no delay in the work.

.3 Notify the Contract Administrator in writing, at the time of submission, of any deviations in samples from requirements of Contract Documents.

.4 Submit samples in sizes and quantities requested.

.5 Where colour, pattern or texture is criterion, submit full range of samples.

.6 Construct field samples at locations acceptable to Contract Administrator.

.7 Reviewed samples will become standards of workmanship and material against which, installed work will be checked on project.

1.19 ROOF PENETRATIONS

.1 Submit shop drawings indicating proposed material, reinforcement, anchorage, fastenings and method of installation. Construction details shall accurately reflect actual job conditions.

.2 Submit manufacturer's product data for materials and prefabricated devices, providing descriptions sufficient for identification at job site. Include manufacturer's printed instructions for installation, including section or other type details.

.3 Perform work in accordance with Specification Section 07 72 00.

1.20 PRESSURE TESTING OF PIPING SYSTEMS

.1 Give minimum 48 hours written notice of date for testing.

.2 Insulate or conceal work only after testing has been completed, reviewed and approval by the Contract Administrator.

.3 Conduct tests in presence of Contract Administrator.

.4 Pipe pressure testing requirements:

- .1 General:
  - .1 Maintain test pressure, without loss for 4 hours unless otherwise specified in applicable codes.
- .2 Fire Protection Systems:
  - .1 To NPFA 13 and requirements of Authority having Jurisdiction.
- .3 Potable Water Systems:
  - .1 To Manitoba Plumbing Code and requirements of Authority having Jurisdiction
- .4 Sanitary Sewer, Storm Sewer and Venting Systems:
  - .1 To Manitoba Plumbing Code and requirements of Authority having Jurisdiction.
- .5 Natural Gas System:
  - .1 To CAN/CSA-B149.1 Natural Gas and Propane Installation Code and requirements of Authority having Jurisdiction.
- .6 Refrigeration Systems:
  - .1 To CSA B52 Mechanical Refrigeration Code and requirements of Authority having Jurisdiction.
- .7 Hydronic Heating & Cooling Systems:
  - .1 To ASME B31.9 Building Services Piping, para. 937.

.5 Equipment: test as specified by manufacturer.

.6 Prior to pressure testing isolate all equipment or other equipment/materials which are not designed to withstand test pressures or test medium.

.7 Should additional testing be required, or testing be redone, the Contractor shall bear all costs related to additional testing.

.8 Once pressure testing is completed, submit pressure test reports for review. Pressure test report shall include, but not be limited to:

- .1 System being tested, and applicable pressure test code/standard.
- .2 Date and time the test(s) was performed, and who the test was performed by.
- .3 If system was tested in sections, identify which section.
- .4 Test medium, and medium temperature.
- .5 Pressure at which test was performed at.

.6 Duration of pressure test.
.7 System pressures at beginning and end of test.
.8 Time stamped photos of pressure gauges before and after completion of pressure test.

1.21 SPECIAL TOOLS

.1 Provide one set of special tools required to service equipment as recommended by manufacturers.

.2 Furnish one commercial quality grease gun, grease and adapters to suit different types of grease and grease fittings.

1.22 SPARE PARTS

.1 Furnish spare parts as follows:

.1 One set of packing for each pump.
.2 One casing joint gasket for each size pump.
.3 One head gasket set for each heat exchanger.
.4 One glass for each gauge glass.
.5 One filter cartridge or set of filter media for each filter or filter bank in addition to final operating set.

.2 Provide one set of special tools required to service equipment as recommended by manufacturers and in accordance with Section 21 05 01 General Provisions – Mechanical.

.3 Furnish one commercial quality grease gun, grease and adapters to suit different types of grease and grease fittings.

1.23 TRIAL USAGE

.1 Contract Administrator reserves the right to use any piece of mechanical equipment, device or material installed under this Contract, for such reasonable lengths of time and at such times as Contract Administrator may require, to make complete and thorough test of same, before final completion and acceptance of any part of Contract. It is agreed and understood, that no claim for damage will be made for any injury or breakage to any parts of the above due to aforementioned tests, whether caused by weakness or inaccuracy of parts, or by defective materials or workmanship of any kind whatsoever. Supply all labour and equipment for such tests.

1.24 SAFETY DEVICE TESTING

.1 Make complete inspection of all safety devices to ensure:

.1 That safety devices are complete in accordance with specifications and manufacturer's recommendations.
.2 That the safety devices are connected and operating according to all local regulations.

1.25 TEMPORARY USE OF EQUIPMENT

.1 Permanent systems and/or equipment is not to be used during construction period without Contract Administrator's written permission.

.2 Equipment used during construction period to be thoroughly cleaned and overhauled. Replace work or damaged parts so equipment is in perfect condition, to entire satisfaction of Contract Administrator.

.3 Provide proper care, attention and maintenance for equipment while it is being used. If in opinion of Contract Administrator, sufficient care and maintenance is not being given to equipment and systems, Contract Administrator reserves the right to forbid further use of said equipment and systems.

.4 Temporary use of equipment shall in no way relieve Contractor of providing twelve month guarantee period to commence as of date of final acceptance of building by Contract Administrator as interpreted by Contract Administrator.

.5 All air filters and pipe strainers are to be replaced prior to turning systems over to the Contract Administrator.

1.26 INSTRUCTIONS TO CONTRACT ADMINISTRATOR'S PERSONNEL

.1 Contractor to schedule and co-ordinate start-up supervision and instruction of Contract Administrator's personnel required of individual equipment suppliers as noted in other sections of Divisions 21 to 23. Contractor's construction supervision is also required to instruct Contract Administrator's personnel in operation and maintenance of all equipment and systems to satisfaction of Contract Administrator.

.2 Provide Contract Administrator with three copies of O&M manuals incorporating following:

- .1 Service instructions – including lists of spare and replacement parts and names and addresses of suppliers.
- .2 Maintenance & Operating instructions.
- .3 Revised shop drawings.

.3 Provide Contract Administrator with one set of Asbuilt Drawings.

.4 Forward manuals and drawings to Contract Administrator prior to final acceptance. Final payment will not be made until all required manuals have been received.

.5 Review instructions with Contract Administrator's representative to ensure a thorough understanding of equipment and its operation.

1.27 TEMPORARY HEATING

.1 Written permission to be obtained from Contract Administrator to use permanent heating system for temporary heat. Systems to be operated in strict accordance with Contract Administrator's recommendations.

1.28 ASBUILT DRAWINGS – ELECTRONIC

.1 Contractor to provide CAD Asbuilt drawings as part of project close out.

.2 Drawings shall be DWG file format and delivered to Contract Administrator on electronic storage media (CD, DVD or USB).

.3 CAD Asbuilt drawings shall contain all changes as noted in physical Asbuilt drawings.

.4 The Contract Administrator will conditionally release all drawings in CAD format to the Contractor on the Contract Administrator's reception of a completed *Release Form: CADD/Electronic File Transfer to Contractor* as provided by the Contract Administrator.

1.29 ASBUILT DRAWINGS - PHYSICAL

.1 Provide one set of Asbuilt Drawings, marked clearly in red pencil, with all changes and deviations from piping and ductwork, etc. shown on Contract Drawings, including all Work Order Changes.

.2 Asbuilt drawings to be maintained on a weekly basis by the Contractor to ensure they are up-to-date and accurate. Drawings shall be made available for reference purposes and inspection.

.3 Provide Contract Administrator with one set of drawing prints with all "Asbuilt" changes noted. Eradicate piping and/or ductwork, etc. shown on original drawings that has been affected by the changes.

.4 Include asbuilt stamp on each drawing indicating the words "Asbuilt Drawing" with the Contractor's name and date.

.5 Perform testing, adjusting and balancing for HVAC using asbuilt drawings.

1.30 PAINTING

.1 Apply at least one coat of corrosion resistant primer paint and finish coat to ferrous supports and site fabricated work.

.2 Prime and touch up marred finished paintwork to match original.

.3 Restore to new condition, finishes which have been damaged too extensively to be merely primed and touched up.

.4 For any required painting of mechanical equipment or appurtenances, confirm colour with Contract Administrator before painting.

1.31 CLEANING

.1 Project Cleanliness

.1 Maintain Work in tidy condition, free from accumulation of waste products and debris, including that caused by Contract Administrator or Sub-Contractors.

.2 Remove waste materials from site at daily regularly scheduled times or dispose of as directed by. Do not burn waste materials on site.
.3 Clear snow and ice from access to building.
.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 Clean interior areas prior to start of finishing work, and maintain areas free of dust and other contaminants during finishing operations.
.7 Store volatile waste in covered metal containers, and remove from premises at end of each working day.
.8 Provide adequate ventilation during use of volatile or noxious substances. Use of building ventilation systems is not permitted for this purpose.
.9 Use only cleaning materials recommended by manufacturer of surface to be cleaned, and as recommended by cleaning material manufacturer.
.10 Schedule cleaning operations so that resulting dust, debris and other contaminants will not fall on wet, newly painted surfaces nor contaminate building systems.

.2 Final Cleaning:

.1 Refer to Section 01 74 00 Cleaning and Waste Management.

1.32 CUTTING AND PATCHING

.1 General.

.1 The equipment and piping installation work specified in this Contract includes the installation by the Contractor of equipment, piping and materials supplied by the Contractor. Cutting and patching of the existing structure is required to implement this work. Providing the necessary cutting and patching and related architectural and civil works shall be co-ordinated by and provided by the Contractor using trade persons skilled and regularly involved in the work being carried out. These works may be simply detailed/described on the drawings or specifications; it is the responsibility of the Contractor to fully investigate and provide the services and materials necessary to execute these works.
.2 Contractor to obtain and pay for x-ray analysis prior to any penetrations through structural concrete members required for the mechanical works.

1.33 EQUIPMENT WARRANTIES AND ACCEPTANCE

.1 Quality Warranty

.1 Manufacturer warrants that equipment furnished shall conform to description and specifications contained herein and shall be free from all defective materials and workmanship and all defects due to design. Upon Contract Administrator's request, manufacturer shall, at its sole expense, promptly repair or replace, all or any part of said equipment which is defective in any respects, within 1 year from the date of acceptance by Contract Administrator after all tests have been complete to satisfaction of

Contract Administrator. This does not apply to failure of equipment due to improper usage.

1.34 TAKE OVER PROCEDURES

.1 Prior to application for Certificate of Substantial Performance, the Contractor shall carefully inspect the minor construction deficiencies are complete and/or corrected and that the building is clean and in condition for occupancy. Notify the Contract Administrator in writing, of satisfactory completion of inspection and request an inspection.

.2 During the Contract Administrators inspection, a list of deficiencies will be tabulated and signed by the Contract Administrator. Correct all deficiencies.

.3 When the Contract Administrator considers that all deficiencies have been corrected and that it appears the requirements of the Contract have been performed including delivery of operation and maintenance manuals, make application for Certificate of Substantial Performance.

END OF SECTION

Part 1 GENERAL

1.1 SUMMARY

.1 Section Includes:

.1 Electrical motors, drives and guards for mechanical equipment and systems.

.2 Supplier and installer responsibility indicated in Motor, Control and Equipment Schedule on electrical drawings and related mechanical responsibility is indicated on Mechanical Equipment Schedule on mechanical drawings.

.3 Control wiring and conduit is specified in Division 26 except for conduit, wiring and connections below 50 V which are related to control systems specified in Division 22 and 23. Refer to Division 26 for quality of materials and workmanship.

1.2 REFERENCES

.1 American Society of Heating, Refrigeration and Air-Conditioning Engineers (ASHRAE)

.1 ASHRAE 90.1, Energy Standard for Buildings Except Low-Rise Residential Buildings (IESNA cosponsored; ANSI approved; Continuous Maintenance Standard).

.2 Electrical Equipment Manufacturers' Association Council (EEMAC)

.3 Health Canada/Workplace Hazardous Materials Information System (WHMIS)

.1 Material Safety Data Sheets (MSDS)

1.3 ACTION AND INFORMATIONAL SUBMITTALS

.1 Submittals: in accordance with Section 21 05 01 General Provisions – Mechanical.

.2 Product Data:

.1 Submit manufacturer’s printed product literature, specifications and datasheet in accordance with Section 21 05 01 General Provisions – Mechanical.

.3 Quality Control:

.1 Certificates: submit certificates signed by manufacturer certifying that materials comply with specified performance characteristics and physical properties.

.2 Instructions: submit manufacturer's installation instructions.

.4 Closeout Submittals:

.1 Provide maintenance data for motors, drives and guards for incorporation into manual specified in Section 21 05 01 General Provisions – Mechanical.

1.4 QUALITY ASSURANCE

.1 Regulatory Requirements: work to be performed in compliance with CEPA, CEAA, TDGA, and applicable Provincial.

1.5 DELIVERY, STORAGE, AND HANDLING

.1 Packing, store and handle materials in accordance with manufacturer's written instructions.

Part 2 PRODUCTS

2.1 GENERAL

.1 Motors: high efficiency, in accordance with local Hydro company standards and to ASHRAE 90.1.

2.2 MOTORS

.1 Provide electric motors for all equipment supplied in this Division. Motors to operate at 1800 rpm, unless noted otherwise. Motor design shall comply with Canadian Electrical Code requirements. All electric motors supplied shall be capable of being serviced locally.

.2 Motors 1 hp (0.75 kW) and larger shall be high efficiency motors as defined and tested to CSA C390 or IEEE 112B and NEMA. Motors 0.5 hp (0.37 kW) and over to be 575 V/3 ph/60 Hz unless specified otherwise. Motors under 0.5 hp (0.37 kW) to be 120V/1 ph/60 Hz.

.3 All three phase motors shall have a service factor of 1.15 times nominal rated horsepower of the motor.

.4 Determine from electrical drawings and specifications, voltage characteristics applying to each individual motor. Where motor voltages are mentioned in this specification ordering motors.

2.3 TEMPORARY MOTORS

.1 If delivery of specified motor will delay completion or commissioning work, install motor approved by Contract Administrator for temporary use. Work will only be accepted when specified motor is installed.

2.4 BELT DRIVES

.1 Fit reinforced belts in sheave matched to drive. Multiple belts to be matched sets.

.2 Use cast iron or steel sheaves secured to shafts with removable keys unless otherwise indicated.

.3 For motors under 10 HP (7.46 kW): standard adjustable pitch drive sheaves, having plus or minus 10% range. Use mid-position of range for specified r/min.

.4 For motors 10 HP (7.46 kW) and over: sheave with split tapered bushing and keyway having fixed pitch unless specifically required for item concerned. Provide sheave of correct size to suit balancing.

.5 Correct size of sheave determined during commissioning.

.6 Minimum drive rating: 1.5 times nameplate rating on motor. Keep overhung loads within manufacturer's design requirements on prime mover shafts.

.7 Motor slide rail adjustment plates to allow for centre line adjustment.

.8 Supply one set of spare belts for each set installed.

2.5 DRIVE GUARDS

.1 Provide guards for unprotected drives.

.2 Guards for belt drives:

- .1 Expanded metal screen welded to steel frame.
- .2 Minimum 0.047” (1.2 mm) thick sheet metal tops and bottoms.
- .3 1.5” (38 mm) diameter holes on both shaft centres for insertion of tachometer
- .4 Removable for servicing.

.3 Provide means to permit lubrication and use of test instruments with guards in place.

.4 Install belt guards to allow movement of motors for adjusting belt tension.

.5 Guard for flexible coupling:

- .1 "U" shaped, minimum 1.6 mm thick galvanized mild steel.
- .2 Securely fasten in place.
- .3 Removable for servicing.

.6 Unprotected fan inlets or outlets:

- .1 Wire or expanded metal screen, galvanized, ¾” (19 mm) mesh.
- .2 Net free area of guard: not less than 80% of fan openings.
- .3 Securely fasten in place.

.4 Removable for servicing.

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 Fasten securely in place.

.2 Make removable for servicing, easily returned into, and positively in position.

.3 Division 26 Electrical to provide starters for all motors, except as otherwise noted.

.4 Division 26 Electrical shall provide wiring from starters to motors.

3.3 CLEANING

.1 Proceed in accordance with Section 21 05 01 General Provisions – Mechanical.

.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 REFERENCES

.1 American Society of Mechanical Engineers (ASME)

- .1 ASME B31.1, Power Piping.
- .2 ASME B31.3, Process Piping.
- .3 ASME B31.9, Building Services Piping.

.2 ASTM International

- .1 ASTM A 125, Standard Specification for Steel Springs, Helical, Heat-Treated.
- .2 ASTM A 307, Standard Specification for Carbon Steel Bolts and Studs, 60,000 PSI Tensile Strength.
- .3 ASTM A 563, Standard Specification for Carbon and Alloy Steel Nuts.

.3 Factory Mutual (FM)

.4 Manufacturer's Standardization Society of the Valves and Fittings Industry (MSS)

- .1 MSS SP 58, Pipe Hangers and Supports – Materials, Design and Manufacture.
- .2 MSS SP 69, Pipe Hangers and Supports – Selection and Application.
- .3 MSS SP 89, Pipe Hangers and Supports – Fabrication and Installation Practices.

.5 Underwriter's Laboratories of Canada (ULC)

1.2 ACTION AND INFORMATIONAL SUBMITTALS

.1 Provide submittals in accordance with Section 21 05 01 General Provisions – Mechanical.

.2 Product Data:

- .1 Provide manufacturer's printed product literature and data sheets for hangers and supports and include product characteristics, performance criteria, physical size, finish and limitations.

.3 Shop Drawings:

- .1 Submit shop drawings and product data in accordance with Sections 21 05 01 General Provisions – Mechanical.
- .2 Submit shop drawings for the following items:
  - .1 Upper Attachment
  - .2 Middle Attachment
  - .3 Lower Attachment

.4 Certificates:

.1 Submit certificates signed by manufacturer certifying that materials comply with specified performance characteristics and physical properties.

.5 Manufacturers' Instructions:

.1 Provide manufacturer's installation instructions.

1.3 CLOSEOUT SUBMITTALS

.1 Provide maintenance data for incorporation into manual specified in Section 21 05 01 General Provisions – Mechanical.

1.4 DELIVERY. STORAGE AND HANDLING

.1 Deliver, store and handle materials in accordance with Section 21 05 01 General Provisions – Mechanical.

Part 2 PRODUCTS

2.1 GENERAL

.1 Fabricate bases, hangers and supports in accordance with the codes and standards noted in Section 1.1.

.2 Ensure that supports, guides, anchors do not transmit excessive quantities of heat to building structure.

.3 Design hangers and supports to support systems under conditions of operation, allow free expansion and contraction, prevent excessive stresses from being introduced into pipework or connected equipment.

.4 Provide for vertical adjustments after erection and during commissioning. Amount of adjustment in accordance with MSS SP-58.

.5 Use components for intended design purpose only. Do not use for rigging or erection purposes.

.6 Seismic Bracing:

.1 Seismic anchors and bracing for all piping, ductwork and equipment shall be designed by the Contractor. Shop drawings shall be provided for each scenario, and shall be signed and sealed by an engineer licensed to practice in the project jurisdiction.

2.2 UPPER ATTACHMENTS

.1 Surface Mount on Concrete:

.1 Hot-dip galvanized carbon steel concrete clevis plate. Sizes 3/8” (9.5 mm) through 1” (25.4 mm) supplied with bolt and nut. Larger than 1” (25.4 mm) supplied with pin and cotters.

.1 Acceptable Product: Anvil Fig. 49.

.2 Drilled concrete insers (four per hanger).
.3 Weldless Eye Nut: Zinc-plated forged steel.
.1 Acceptable Product: Anvil Fig. 290/290L.

.2 Drilled Concrete Inserts:

.1 Flanged, carbon steel internally threaded machine bolt anchor. Tested in accordance with ASTM E 488.
.2 Acceptable Product: Dewalt Steel Dropin.

.3 Suspension from lower flange of I-Beam:

.1 NPS 2" (50 mm) and smaller:

.1 Malleable iron C-clamp with hardened steel cup point, setscrew and locknut. To MSS SP-69 and MSS SP-58 (Type 23), ULC and FM approved.

.1 Acceptable Product: Anvil Fig. 86.

.2 Hot-dip galvanized carbon steel retaining clip. Length of retaining strap to allow at least 1" (25.4 mm) of strap bent over the bottom flange.

.1 Acceptable Product: Anvil Fig. 89.

.2 NPS 2-1/2" (63 mm) and larger:

.1 Hot-dip galvanized carbon steel heavy duty beam clamp with zinc plated fasteners. To MSS SP-69 and MSS SP-58 (Type 21).

.1 Acceptable Product: Anvil Fig. 134

.2 Zinc-plated forged steel weldless eye nut. To MSS SP-69 and MSS SP-58 (Type 17).

.1 Acceptable Product: Anvil Fig. 290/290L.

.4 Suspension from Upper Flange of I-Beam:

.1 NPS 2" (50 mm) and smaller:

.1 ductile iron top-of-beam C-clamp with hardened steel cup point, setscrew and locknut. To MSS SP-69 and MSS SP-58 (Type 19 & 23), ULC and FM approved.

.1 Acceptable Product: Anvil Fig. 92

.2 NPS 2-1/2" (63 mm) and larger:

.1 Fabricated carbon steel J-hook, hole drilled to suit hanger rod diameter.

2.3 MIDDLE ATTACHMENT

.1 Requirements:

Type:	Threaded Rod with Electro-Galvanized Finish
Material:	Carbon Steel

2.4 SHOP AND FIELD-FABRICATED ASSEMBLIES

.1 Steel brackets: In accordance with the requirements of ASME B31.1 and MSS SP 58.

2.5 SUPPLEMENTARY STRUCTURAL MEMBERS

.1 Provide as required for support of piping, anchoring and sway bracing under active loading

.2 Any supplementary structural members shall be hot-dip galvanized.

2.6 EXPANSION JOINTS

.1 Provide prefabricated expansion joints where required for thermal movement.

2.7 RISER CLAMPS

.1 Steel or cast-iron pipe:

.1 Hot-dip galvanized carbon steel and zinc plated fasteners. To MSS SP-69 and MSS SP-58 (Type 42).

.2 Acceptable Product: Anvil Fig. 40.

.2 Copper pipe: carbon steel copper plated to MSS SP58, type 42.

.1 Epoxy coated carbon steel and zinc plated fasteners. To MSS SP-69 and MSS SP-58 (Type 42).

.2 Acceptable Product: Anvil Fig. 008CTG.

.3 Bolts: to ASTM A307.

.4 Nuts: to ASTM A563.

2.8 EQUIPMENT SUPPORTS

.1 Fabricate equipment supports not provided by equipment manufacturer from structural grade steel, submit calculations with shop drawings.

2.9 EQUIPMENT ANCHOR BOLTS AND TEMPLATES

.1 Provide templates to ensure accurate location of anchor bolts.

2.10 HOUSE-KEEPING PADS

.1 Provide 4” (102 mm) high (unless otherwise specified on drawings) concrete housekeeping pads for base-mounted equipment; size pads 2” (51 mm) larger than equipment, all sides; chamfer pad edges.

.2 Where tying into existing house keeping pads, Form concrete around existing housekeeping pad to meet requirements listed.

Part 3 EXECUTION

3.1 HANGER SPACING

.1 Spacing and middle attachment diameter as specified in paragraphs below or as found in table below, whichever is more stringent.

.1 Plumbing Piping: most stringent requirements of Canadian Plumbing Code, or authority having jurisdiction

.2 Fire Protection: designed and installed to meet the applicable fire code(s).

.3 Gas Piping: in accordance with CSA B149.1 Natural Gas and Propane Installation Code.

.4 Flexible Joint Roll Groove Pipe: in accordance with table below, but not less than one hanger at joints.

.5 Within 12” (300mm) of each horizontal elbow

Pipe Size NPS (mm)	Maximum Spacing for Steel (Water) ft (m)	Maximum Spacing for Steel (Steam, Gas, or Air) ft (m)	Maximum Spacing for Copper ft (m)	Rod Diameter in. (mm)
Up to 1-1/4 (32)	7 (2.1)	9 (2.7)	6 (1.8)	3/8 (10)
1-1/2 (38)	9 (2.7)	9 (2.7)	8 (2.4)	3/8 (10)
2 (50)	10 (3.0)	13 (4.0)	8 (2.4)	3/8 (10)
2-1/2 (65)	12 (3.7)	15 (4.6)	10 (3.0)	1/2 (13)
3 (75)	12 (3.7)	15 (4.6)	10 (3.0)	1/2 (13)
3-1/2 (90)	13 (4.0)	17 (5.2)	11 (3.4)	1/2 (13)
4 (100)	14 (4.3)	17 (5.2)	12 (3.7)	5/8 (16)
5 (125)	16 (4.9)	21 (6.4)	-	5/8 (16)
6 (150)	17 (5.2)	21 (6.4)	-	7/8 (22)
8 (200)	19 (5.8)	24 (7.3)	-	7/8 (22)
10 (250)	22 (6.1)	30 (9.1)	-	7/8 (22)
12 (300)	23 (7.0)	30 (9.1)	-	7/8 (22)

3.2 HANGER INSTALLATION

.1 Install hanger so that rod is vertical under operating conditions.

.2 Adjust hangers to equalize load.

.3 Support from structural members. Where structural bearing does not exist or inserts are not in suitable locations, provide supplementary structural steel members.

.4 Paint all supplementary support steel as noted in Section 21 05 01 General Provisions – Mechanical.

END OF SECTION

Part 1 GENERAL

1.1 SUMMARY

.1 Section Includes:

.1 Materials and requirements for the identification of piping systems, duct work, valves and controllers, including the installation and location of identification systems.

1.2 REFERENCES

.1 Canadian Gas Association (CGA)

.1 CSA/CGA B149.1, Natural Gas and Propane Installation Code.
.2 CSA B128.1/CSA B128.2 Design and Installation of Non-Potable Water Piping Systems / Maintenance and Field Testing of Non-Potable Water Systems.

.2 Canadian General Standards Board (CGSB)

.1 CAN/CGSB-1.60, Interior Alkyd Gloss Enamel.
.2 CAN/CGSB-24.3, Identification of Piping Systems.

.3 National Fire Protection Association (NFPA)

.1 NFPA 13, Standard for the Installation of Sprinkler Systems
.2 NFPA 14, Standard for the Installation of Standpipe and Hose Systems

1.3 ACTION AND INFORMATIONAL SUBMITTALS

.1 Product Data:

.1 Submittals: in accordance with Sections 21 05 01 General Provisions – Mechanical.
.2 Product data to include paint color chips, other products specified in this section.

.2 Samples:

.1 Submit samples in accordance with Sections 21 05 01 General Provisions – Mechanical.
.2 Samples to include nameplates, labels, tags, lists of proposed legends.

1.4 QUALITY ASSURANCE

.1 Quality assurance submittals: submit following in accordance with Sections 21 05 01 General Provisions – Mechanical.

1.5 DELIVERY, STORAGE, AND HANDLING

.1 Packing, shipping, handling and unloading:

.1 Deliver, store and handle materials in accordance with manufacturer's written instructions.

.2 Refer to Sections 21 05 01 General Provisions – Mechanical.

Part 2 PRODUCTS

2.1 MANUFACTURER'S EQUIPMENT NAMEPLATES

.1 Metal or plastic laminate nameplate mechanically fastened to each piece of equipment by manufacturer.

.2 Lettering and numbers raised or recessed.

.3 Information to include, as appropriate:

.1 Equipment: manufacturer's name, model, size, serial number, capacity.
.2 Motor: voltage, Hz, phase, power factor, duty, frame size.

2.2 SYSTEM NAMEPLATES

.1 Colours:

.1 Hazardous: red letters, white background.
.2 Elsewhere: black letters, white background (except where required otherwise by applicable codes).

.2 Construction:

.1 3 mm thick laminated plastic or white anodized aluminum, matte finish, with square corners, letters accurately aligned and machine engraved into core.

.3 Sizes:

.1 Conform to following table:

Size # mm	Sizes (mm)	No. of Lines	Height of Letters (mm)
1	10 x 50	1	3
2	13 x 75	1	5
3	13 x 75	2	3
4	20 x 100	1	8
5	20 x 100	2	5
6	20 x 100	1	8
7	25 x 125	1	12
8	25 x 125	2	8
9	35 x 200	1	20

.2 Use maximum of 25 letters/numbers per line.

.4 Locations:

.1 Terminal cabinets, control panels: use size # 5.
.2 Equipment in Mechanical Rooms: use size # 9.

2.3 EXISTING IDENTIFICATION SYSTEMS

.1 Apply existing identification system to new work.

.2 Where existing identification system does not cover for new work, use identification system specified this section.

.3 Before starting work, obtain written approval of identification system from Contract Administrator.

2.4 PIPING SYSTEMS GOVERNED BY CODES

.1 Identification:

.1 Natural gas: to CSA/CGA B149.1.

.2 Propane gas: to CSA B149.1.

.1 Sprinklers: to NFPA 13.
.2 Standpipe and hose systems: to NFPA 14.
.3 Non-potable water systems: to CSA B128.1

2.5 IDENTIFICATION DUCTWORK SYSTEMS

.1 2” (50 mm) high stencilled letters and directional arrows 6” (150 mm) long x 2” (50 mm) high.

.2 Colours: back, or coordinated with base colour to ensure strong contrast.

2.6 VALVES, CONTROLLERS, & EQUIPMENT

.1 Valves:

.1 Brass tags with ½” (13 mm) stamped identification data filled with black paint.

.2 Controllers & Equipment:

.1 Black limacoid with white lettering, per Section 2.2 System Nameplates.

.3 Include flow diagrams for each system, of approved size, showing charts and schedules with identification of each tagged item, valve type, service, function, normal position, location of tagged item.

2.7 CONTROLS COMPONENTS IDENTIFICATION

.1 Identify all systems, equipment, components, controls, sensors with system nameplates specified in this section.

.2 Inscriptions to include function and (where appropriate) fail-safe position.

2.8 LANGUAGE

.1 Identification in English.

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 TIMING

.1 Provide identification only after painting has been completed.

3.3 INSTALLATION

.1 Perform work in accordance with CAN/CGSB-24.3 except as specified otherwise.

.2 Provide ULC and/or CSA registration plates as required by respective agency.

3.4 NAMEPLATES

.1 Locations:

.1 In conspicuous location to facilitate easy reading and identification from operating floor.

.2 Standoffs:

.1 Provide for nameplates on hot and/or insulated surfaces.

.3 Protection:

.1 Do not paint, insulate or cover.

3.5 LOCATION OF IDENTIFICATION ON PIPING AND DUCTWORK SYSTEMS

.1 On long straight runs in open areas in boiler rooms, equipment rooms, galleries, tunnels: at not more than 55 ft (17 m) intervals and more frequently if required to ensure that at least one is visible from any one viewpoint in operating areas and walking aisles.

.2 Adjacent to each change in direction.

.3 At least once in each small room through which piping or ductwork passes.

.4 On both sides of visual obstruction or where run is difficult to follow.

.5 On both sides of separations such as walls, floors, partitions.

.6 Where system is installed in pipe chases, ceiling spaces, galleries, confined spaces, at entry and exit points, and at access openings.

.7 At beginning and end points of each run and at each piece of equipment in run.

.8 At point immediately upstream of major manually operated or automatically controlled valves, and dampers. Where this is not possible, place identification as close as possible, preferably on upstream side.

.9 Identification easily and accurately readable from usual operating areas and from access points.

.1 Position of identification approximately at right angles to most convenient line of sight, considering operating positions, lighting conditions, risk of physical damage or injury and reduced visibility over time due to dust and dirt.

.10 Non-Potable Water piping:

.1 Non-potable water piping: at not more than 5 ft (1.5 m) intervals and more frequently if required to ensure that at least one is visible from any one viewpoint.

.2 Buried piping shall be identified with a permanent warning tape installed at least 12” (300 mm) above the pipe, running lengthwise. In addition, a tracer wire shall be installed for non-metallic pipes.

3.6 VALVES, CONTROLLERS, & EQUIPMENT

.1 Valves and operating controllers, except at plumbing fixtures, radiation, or where in plain sight of equipment they serve: Secure tags with non-ferrous chains or closed "S" hooks.

.2 Equipment such as boilers, chillers, air handlers, and terminal equipment such as fan coils, VAVs, heat pumps, etc. shall be provided with lamacoids to identify their tag number.

.3 Install one copy of flow diagrams, valve schedules mounted in frame behind non-glare glass where directed Contract Administrator. Provide one copy (reduced in size if required) in each operating and maintenance manual.

.4 Number valves in each system consecutively.

3.7 CLEANING

.1 Proceed in accordance with Section 21 05 01 General Provisions – Mechanical.

.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 TAB means to test, adjust and balance to perform in accordance with requirements of Contract Documents and to do all other work as specified in this section.

.2 TAB to be performed by balancing company who is a registered member of AABC and final TAB report shall bear seal and certification number of AABC registration.

1.2 QUALIFICATIONS OF TAB PERSONNEL

.1 TAB; performed in accordance with the requirements of standard under which TAB Firm's qualifications are approved:

.1 Associated Air Balance Council, (AABC) National Standards for Total System Balance.

.2 Sheet Metal and Air Conditioning Contractors' National Association (SMACNA), HVAC TAB HVAC Systems - Testing, Adjusting and Balancing.

.2 Recommendations and suggested practices contained in the TAB Standard: mandatory.

.3 Use TAB Standard provisions, including checklists, and report forms to satisfy Contract requirements.

.4 Use TAB Standard for TAB, including qualifications for TAB Firm and Specialist and calibration of TAB instruments.

.5 Where instrument manufacturer calibration recommendations are more stringent than those listed in TAB Standard, use manufacturer's recommendations.

1.3 PURPOSE OF TAB

.1 Test to verify proper and safe operation, determine actual point of performance, evaluate qualitative and quantitative performance of equipment, systems and controls at design, average and low loads using actual or simulated loads.

.2 Adjust and regulate equipment and systems so as to meet specified performance requirements and to achieve specified interaction with other related systems under normal and emergency loads and operating conditions.

.3 Balance systems and equipment to regulate flow rates to match design conditions.

1.4 CO-ORDINATION

.1 Schedule time required for TAB (including repairs, re-testing) into project construction and completion schedule so as to ensure completion before acceptance of project.

.2 Do TAB of each system independently and subsequently, where interlocked with other systems, in unison with those systems.

1.5 PRE-TAB REVIEW

.1 Review Contract Documents before project construction is started and confirm adequacy of provisions for TAB and all other aspects of design and installation pertinent to success of TAB.

.2 Review specified standards and report to Contract Administrator all proposed procedures which vary from standard.

.3 During construction, co-ordinate location and installation of all TAB devices, equipment, accessories, measurement ports and fittings.

1.6 START-UP

.1 Follow start-up procedures as recommended by equipment manufacturer unless specified otherwise.

.2 Follow special start-up procedures specified elsewhere in Divisions 21 & 23.

1.7 OPERATION OF SYSTEMS DURING TAB

.1 Operate systems for length of time required for TAB and as required by the Contract Administrator for verification of TAB reports.

1.8 START OF TAB

.1 Notify Contract Administrator 7 days prior to start of TAB.

.2 Start TAB only when building is essentially completed including:

.1 Installation of ceilings, doors, windows, other construction affecting TAB.
.2 Application of weatherstripping, sealing, caulking.
.3 All pressure, leakage, other tests specified elsewhere in Divisions 21 & 23.
.4 All provisions for TAB installed and operational.
.5 Start-up, verification for proper, normal and safe operation of all mechanical and associated electrical and control systems affecting TAB including but not limited to:

.1 Proper thermal overload protection in place for electrical equipment.

.2 Air Systems:

.1 Filters in place, clean.

.2 Duct systems clean.

.3 Ducts, air shafts, ceiling plenums are airtight to within specified tolerances.

.4 Correct fan rotation.

.5 Fire, smoke, volume control dampers installed and open.

.6 Coil fins combed, clean.

.7 Access doors, installed, closed.

.8 Outlets installed, volume control dampers open.

.3 Liquid systems:

.1 Flushed, filled, vented.

.2 Correct pump rotation.

.3 Strainers in place, baskets clean.

.4 Isolating and balancing valves installed, open.

.5 Calibrated balancing valves installed, at factory settings.

.6 Chemical treatment systems complete, operational.

1.9 APPLICATION TOLERANCES

.1 Do TAB to following tolerances of design values:

.1 Laboratory HVAC Systems: plus 10%, minus 0%
.2 HVAC systems: plus 5%, minus 5%.
.3 Hydronic systems: plus 10%, minus 10%.

1.10 ACCURACY TOLERANCES

.1 Measured values to be accurate to within plus or minus 2% of actual values.

1.11 INSTRUMENTS

.1 Calibrate in accordance with requirements of most stringent of referenced standard for either applicable system or HVAC system.

.2 Calibrate within 3 months of TAB.

1.12 ACTION AND INFORMATIONAL SUBMITTALS

.1 Submit, prior to commencement of TAB:

.1 Proposed methodology and procedures for performing TAB if different from referenced standard.

1.13 TAB REPORT

.1 TAB report to show all results in Imperial units and to include:

.1 Project record drawings.
.2 System schematics.
.3 Date of TAB, date of report.

.2 Submit copy of TAB Report to Contract Administrator for verification and approval, in English in PDF format.

.3 Incorporate review comments and submit final TAB report in PDF format. Include in project O&M manual described in Section 21 05 01 General Provisions - Mechanical.

1.14 VERIFICATION

.1 Reported results subject to verification by Contract Administrator.

.2 Provide personnel and instrumentation to verify up to 100% of the reported results.

.3 Number and location of verified results as directed by Contract Administrator.

.4 Pay associated costs (labor, travel, accommodations, etc.) as required to repeat TAB measurements to satisfaction of Contract Administrator.

1.15 SETTINGS

.1 After TAB is completed to satisfaction of Contract Administrator, replace drive guards, close all access doors, lock all devices in set positions, ensure sensors are at required settings.

.2 Permanently mark all setting to allow restoration at any time during life of facility. Markings not to be eradicated or covered in any way.

1.16 COMPLETION OF TAB

.1 TAB to be considered complete only when final TAB Report received and approved by Contract Administrator.

1.17 AIR SYSTEMS

.1 Standard TAB to be to most stringent of TAB standards of AABC or ASHRAE.

.2 Do TAB of following systems, equipment, and components including all grilles, dampers and zone pressurization unless otherwise stated.

.1 New exhaust fans, EF-R601 & EF-R611
.2 New air handling unit, AHU-R600 & AHU-R610

.3 Measurements: to include, but not limited to, the following as appropriate for systems, equipment, components, controls: air velocity, static pressure, flow rate, pressure drop (or loss), temperatures (dry bulb), duct cross-sectional area, RPM electrical power.

.4 Locations of equipment measurements; to include, but not limited to, the following as appropriate:

.1 Outlet of each damper, grille, terminal unit and fan.
.2 At controllers, controlled device.

.5 Locations of systems measurements to include, but not be limited to, following as appropriate: each main duct, main branch, sub-branch, run-out (or grille, register or diffuser).

Part 2 PRODUCTS

.1 Not Used.

Part 3 EXECUTION

.1 Not Used.

END OF SECTION

Part 1 GENERAL

1.1 REFERENCES

.1 American Society of Heating, Refrigeration and Air Conditioning Engineers (ASHRAE)

.1 ANSI/ASHRAE/IESNA 90.1, SI; Energy Standard for Buildings Except Low-Rise Residential Buildings.

.2 ASTM International Inc.

.1 ASTM B 209M, Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate (Metric).
.2 ASTM C 335, Standard Test Method for Steady State Heat Transfer Properties of Pipe Insulation.
.3 ASTM C 411, Standard Test Method for Hot-Surface Performance of High-Temperature Thermal Insulation.
.4 ASTM C 449/C 449M, Standard Specification for Mineral Fiber-Hydraulic-Setting Thermal Insulating and Finishing Cement.
.5 ASTM C 547, Standard Specification for Mineral Fiber Pipe Insulation.
.6 ASTM C 553, Standard Specification for Mineral Fiber Blanket Thermal Insulation for Commercial and Industrial Applications.
.7 ASTM C 612, Standard Specification for Mineral Fiber Block and Board Thermal Insulation.
.8 ASTM C 795, Standard Specification for Thermal Insulation for Use in Contact with Austenitic Stainless Steel.
.9 ASTM C 921, Standard Practice for Determining the Properties of Jacketing Materials for Thermal Insulation

.3 American National Standards Institute (ANSI) / National Fire Protection Association (NFPA)

.1 ANSI/NFPA 90A, Standard for the Installation of Air-Conditioning and Ventilating Systems
.2 ANSI/NFPA 90B Standard for the Installation of Warm Air Heating and Air-Conditioning Systems.

.4 Canadian General Standards Board (CGSB)

.1 CGSB 51-GP-52Ma, Vapour Barrier, Jacket and Facing Material for Pipe, Duct and Equipment Thermal Insulation.

.5 Green Seal Environmental Standards (GSES)

.1 Standard GS-36, Commercial Adhesives.

.6 Thermal Insulation Association of Canada (TIAC): National Insulation Standards

.7 Underwriters Laboratories of Canada (ULC)

.1 CAN/ULC-S102, Method of Test for Surface Burning Characteristics of Building Materials and Assemblies.
.2 CAN/ULC-S701, Standard for Thermal Insulation, Polystyrene, Boards and Pipe Covering.
.3 CAN/ULC-S704.1, Standard for Thermal Insulation, Polyurethane and Polyisocyanurate, Boards, Faced.

1.2 DEFINITIONS

.1 For purposes of this section:

.1 "CONCEALED" – insulated mechanical services and equipment tin suspended ceilings and non-accessible chases and furred-in spaces.
.2 "EXPOSED" – will mean "not concealed" as defined herein.
.3 Insulation Systems – insulation material, fasteners, jackets, and all related accessories required for a complete installation.

.2 TIAC Codes:

.1 CRD: Code Round Ductwork,
.2 CRF Code Rectangular Finish.

1.3 ACTION AND INFORMATIONAL SUBMITTALS

.1 Submittals: in accordance with Section 21 05 01 General Provisions – Mechanical.

.2 Product Data:

.1 Submit manufacturer's printed product literature, specifications and datasheet in accordance with Section 21 05 01 General Provisions – Mechanical. Include product characteristics, performance criteria, and limitations.

.3 Shop Drawings:

.1 Submit shop drawings in accordance with Section 21 05 01 General Provisions – Mechanical.

.4 Manufacturers' Instructions:

.1 Provide manufacture's written duct insulation jointing recommendations. and special handling criteria, installation sequence, cleaning procedures.

1.4 QUALITY ASSURANCE

.1 Qualifications:

.1 Installer: specialist in performing work of this Section, and have at least 3 years successful experience in this size and type of project, member of TIAC.

1.5 DELIVERY, STORAGE AND HANDLING

.1 Packing, shipping, handling and unloading:

.1 Deliver, store and handle in accordance with manufacturer's written instructions and Section 21 05 01 General Provisions – Mechanical.
.2 Deliver, store and handle materials in accordance with manufacturer's written instructions.
.3 Deliver materials to site in original factory packaging, labelled with manufacturer's name, address.

.2 Storage and Protection:

.1 Protect from weather, construction traffic.
.2 Protect against damage.
.3 Store at temperatures and conditions required by manufacturer.

Part 2 PRODUCTS

2.1 FIRE AND SMOKE RATING

.1 To CAN/ULC-S102

.1 Maximum flame spread rating: 25.
.2 Maximum smoke developed rating: 50.

.2 To CAN/ULC-S102

.1 Maximum flame spread rating: 0 (TIAC Code CEF/2).
.2 Maximum smoke developed rating: 0 (TIAC Code CEF/2).

2.2 INSULATION

.1 Mineral fibre: as specified includes glass fibre, rock wool, slag wool.

.2 Thermal conductivity ("k" factor) not to exceed specified values at 74°F (24°C) mean temperature when tested in accordance with ASTM C 335.

.3 TIAC Code A-1: rigid moulded mineral fibre without factory applied vapour retarder jacket and reinforced kraft paper all service jacket.

.1 Mineral fibre: to CAN/ULC-S702.
.2 Maximum "k" factor: to CAN/ULC-S702.

.4 TIAC Code A-3: rigid moulded mineral fibre with factory applied vapour retarder jacket and reinforced kraft paper all service jacket.

.1 Mineral fibre: to CAN/ULC-S702.
.2 Jacket: to CGSB 51-GP-52Ma.
.3 Maximum "k" factor: to CAN/ULC-S702.

.5 TIAC Code C-1: rigid mineral fibre board without factory applied vapour retarder jacket.

.1 Mineral fibre: ASTM C 612.
.2 Maximum “k” factor: ASTM C 612.

.6 TIAC Code C-4: rigid mineral fibre board faced with factory applied vapour retarder jacket:

.1 Mineral fibre: ASTM C 612.
.2 Jacket: to CGSB 51-GP-52MA.
.3 Maximum "k" factor: ASTM C 612.

.7 TIAC Code C-2: mineral fibre blanket faced with factory applied vapour retarder jacket (as scheduled in PART 3 of this section).

.1 Mineral fibre: to ASTM C 553
.2 Jacket: to CGSB 51-GP-52Ma
.3 Maximum "k" factor: to ASTM C 553

2.3 JACKETING

.1 Polyvinyl Chloride (PVC):

.1 One-piece moulded type and sheet to CAN/CGSB-51.53 with pre-formed shapes as required.
.2 Colours: to match adjacent finish paint.
.3 Minimum service temperatures: -20°C.
.4 Maximum service temperature: 65°C.
.5 Moisture vapour transmission: 0.02 perm.
.6 Thickness: 1.6 mm.
.7 Fastenings:

.1 Use solvent weld adhesive compatible with insulation to seal laps and joints.

.2 Tacks.

.3 Pressure sensitive vinyl tape of matching colour.

.2 Canvas:

.1 220 gm/m^2 cotton, plain weave, treated with dilute fire retardant lagging adhesive to ASTM C921.
.2 Lagging adhesive: compatible with insulation.
.3 Colour: confirm with Contract Administrator prior to installation.

2.4 ACCESSORIES

.1 Vapour retarder lap adhesive:

.1 Water based, fire retardant type, compatible with insulation.

.2 Indoor Vapour Retarder Finish:

.1 Vinyl emulsion type acrylic, compatible with insulation.

.3 Insulating Cement: hydraulic setting on mineral wool, to ASTM C 449.

.1 Reinforcing fabric: Fibrous glass, untreated 305 g/m^2.

.4 Tape: self-adhesive, aluminum, reinforced, 75 mm wide minimum.

.5 Contact adhesive: quick-setting.

.6 Canvas adhesive: washable.

.7 Tie wire: 1.5 mm stainless steel.

.8 Facing: 25 mm galvanized steel hexagonal wire mesh stitched on both faces of insulation.

.9 Fasteners: 4 mm diameter pins with 35 mm diameter clips, length to suit thickness of insulation.

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 PRE-INSTALLATION REQUIREMENTS

.1 Pressure test ductwork systems complete (if required), witness and certify.

.2 Ensure any other required tests have been completed and approved by Contract Administrator.

.3 Ensure surfaces are clean, dry, free from foreign material.

3.3 INSTALLATION

.1 Install in accordance with TIAC National Standards and ANSI/NFPA 90A and ANSI/NFPA 90B.

.2 Apply insulation materials, accessories and finishes in accordance with manufacturer’s recommendations and as specified. Adhere and seal vapor barrier using vapor seal adhesives.

.3 Use no less than 2 layers of insulation with staggered joints when required nominal thickness exceeds 75 mm.

.4 Vapour barriers and insulation to be unbroken over full length of duct or surface, without penetration for hangers, standing duct seams and without interruption at sleeves and supports. Insulate strap hangers 100 mm beyond insulated duct.

.5 Use stand-offs for duct mounted control accessories.

.6 Apply 1 mm thick galvanized sheet metal corners (nosings) in traffic areas to ductwork in mechanical rooms.

.7 Fasteners: install at 300 mm on centre in horizontal and vertical directions, minimum two rows each side.

.8 Where PVC jackets are installed on round ductwork, rigid molded insulation shall be used.

3.4 DUCTWORK INSULATION SCHEDULE

.1 Insulation types and thicknesses: conform to following table.

Duct System	Round		Rectangular		Insulation Thickness (in.)
	Warm	Cold	Warm	Cold	
Indoor Ductwork					
Outdoor/Combustion Air	A-1, C-2	A-3, C-2	C-1, C-2	C-2, C-4	2
Exhaust/Relief Air	A-1, C-2	A-3, C-2	C-1, C-2	C-2, C-4	1.5

.2 The table above shall be supplemented with the following notes:

.1 Ductwork carrying conditioned air and installed outdoors needs to be insulated to same level as building wall. Provide thickness noted above unless noted otherwise.

.2 Rigid board insulation shall be used on ductwork larger than 48” wide or tall. Blanket insulation shall be used otherwise.

.3 Exposed round ductwork requiring jacket shall be provided with rigid molded insulation.

.4 Exposed rectangular ductwork requiring jacket shall be provided with rigid board insulation.

.5 Exhaust air, relief air, and return air ductwork connected to outdoors shall be insulated 10 ft back from outside wall / roof or until the first motorized damper, whichever is longer.

.6 Where insulation is installed up to equipment requiring clearances to combustibles, non-combustible insulation shall be installed in the clearance space.

.7 If motorized dampers on ductwork communicating with outside are not installed in the same plane as the exterior wall, all ductwork between the exterior wall and motorized damper needs to be insulated to the same degree as the building envelope using fiberglass insulation.

.3 Finishes:

.1 Exposed indoors:

.1 Round: PVC jacket.

.2 Rectangular: Canvas jacket.

.2 Installation: to appropriate TIAC code:

.1 Round: CRD/2 to CRD/5

.2 Rectangular: CRF/1 to CRF/4

3.5 CLEANING

.1 Proceed in accordance with Section 21 05 01 General Provisions – Mechanical.

.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, installation and commissioning procedures for electric heating, ventilation and cooling control system(s).

1.2 GENERAL INTENT AND RELATED INFORMATION

.1 All work of the work shall be coordinated and provided by the single Contractor.

.2 The work shall be scheduled, coordinated, and interfaced with the associated work of other trades. Reference the applicable sections for details.

.3 The work shall be as required by the Specifications, Point Schedules and Drawings.

.4 If the Contractor believes there are conflicts or missing information in the project documents, the Contractor shall promptly request clarification and instruction from the design team.

1.3 DEFINITIONS

.1 Analog: A continuously variable system or value not having discrete levels. Typically exists within a defined range of limiting values.

.2 Binary: A two-state system where an “on” condition is represented by one discrete signal level and an “Off” condition is represented by a second discrete signal level.

.3 Control Sequence: A pre-programmed arrangement of software algorithms, logical computation, target values and limits as required to attain the defined operational control objectives.

.4 Direct Digital Control: The digital algorithms and pre-defined arrangements included in the software to provide direct closed-loop control for the designated equipment and controlled variables. Inclusive of Proportional, Derivative and Integral control algorithms together with target values, limits, logical functions, arithmetic functions, constant values, timing considerations and the like.

.5 Provide: The term “Provide” and its derivatives when used in this Division shall mean to furnish, install in place, connect, calibrate, test, commission, warrant, document and supply the associated required services ready for operation.

.6 Furnish: The term “Furnish” and its derivatives when used in this Division shall mean supply at the Contractor’s expense to the designated third party trade

Contractor for installation. Contractor shall connect furnished items, calibrate, test, commission, warrant and document.

.7 Wiring: The term "Wiring" and its derivatives when used in this Division shall mean provide the BMS wiring and terminations.

.8 Install: The term "Install" and its derivatives when used in this Division shall mean receive at the jobsite and mount.

.9 The use of words in the singular in these Division documents shall not be considered as limiting when other indications in these documents denote that more than one such item is being referenced.

.10 Headings, paragraph numbers, titles, shading, bolding, underscores, clouds and other symbolic interpretation aids included in the Division documents are for general information only and are to assist in the reading and interpretation of these Documents.

.11 The following abbreviations and acronyms may be used in describing the work of this Division:

AHJ	Authority Having Jurisdiction
AI	Analog Input
AO	Analog Output
AWG	American Wire Gauge
BTL	BACnet® Testing Laboratories
CPU	Central Processing Unit
DDC	Direct Digital Control
DI	Digital Input
DO	Digital Output
EEPROM	Electronically Erasable Programmable Read Only Memory
EMI	Electromagnetic Interference
HD	High Definition
HOA	Hand-Off-Auto
I/O	Input/Output
IT	Information Technology
LAN	Local Area Network
LCD	Liquid Crystal Display
LED	Light Emitting Diode
MCC	Motor Control Center
NC	Normally Closed
NO	Normally Open
OAT	Outdoor Air Temperature
OEM	Original Equipment Manufacturer (Private label)
OWS	Operator Workstation
PC	Personal Computer

ppm	parts per million
RAM	Random Access Memory
RF	Radio Frequency
RFI	Radio Frequency Interference
RH	Relative Humidity
ROM	Read Only Memory
RTD	Resistance Temperature Device
TCP/IP	Transmission Control Protocol/Internet Protocol
UPS	Uninterruptible Power Supply
VAC	Volts, Alternating Current
VAV	Variable Air Volume
VDC	Volts, Direct Current
VPN	Virtual Private Network
VSD	Variable Speed Drive
WAN	Wide Area Network

1.4 REFERENCES

.1 National Fire Protection Association (NFPA) Standards

.2 National Electric Code (NEC) and applicable local Electric Code

.3 UL

- .1 UL listing and labels
- .2 UL 864 10th Edition UUKL Smoke Control (for USA and Canada)
- .3 UL 268 Smoke Detector
- .4 UL 916 Energy Management.

.4 National Fire Protection Association (NFPA)

- .1 NFPA 70 – National Electrical Code
- .2 NFPA 90A – Standard For The Installation Of Air Conditioning And Ventilating Systems
- .3 NFPA 92A and 92B Smoke Purge/Control Equipment

.5 Factory Mutual (FM)

.6 American National Standards Institute (ANSI)

- .1 ASHRAE/ANSI 135, Data Communication Protocol for Building Automation and Control Systems (BACnet).
- .2 ANSI/EIA 909.1-A-1999

.7 National Electric Manufacturer's Association (NEMA)

.8 American Society of Mechanical Engineers (ASME)

.9 American Society of Heating, Refrigerating and Air Conditioning Engineers (ASHRAE)

.10 Air Movement and Control Association (AMCA)

.11 Institute of Electrical and Electronic Engineers (IEEE)

.12 American Standard Code for Information Interchange (ASCII)

.13 Electronics Industries Association (EIA)

.14 Occupational Safety and Health Administration (OSHA)

.15 American Society for Testing and Materials (ASTM)

.16 Federal Communications Commission (FCC) including Part 15, RF Devices

.17 Americans Disability Act (ADA)

.18 Canadian Standards Association (CSA)

.1 CSA C22.1 Canadian Electrical Code.

.19 National Research Council of Canada (NRC)

.1 National Building Code of Canada.

1.5 ACTION AND INFORMATIONAL SUBMITTALS

.1 Shop Drawings, Product Data, and Samples

.1 The Contractor shall submit a list of all shop drawings with submittals dates within 30 days of Contract award.

.2 Submittals shall be in defined packages. Each package shall be complete, shall only reference itself, and previously submitted packages. The packages shall be as approved by the Contract Administrator for Contract compliance.

.3 Allow 15 working days for the review of each package by the Contract Administrator in the scheduling of the total work.

.4 Equipment and systems requiring approval of local authorities must comply with such regulations and be approved. Filing shall be at the expense of the Contractor where filing is necessary. Provide a copy of all related correspondence and permits to the Contract Administrator.

.5 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.

.6 The Contractor shall correct any errors or omissions noted in the first review.

.7 At a minimum, submit the following:

.1 Systems schematics, sequences, and flow diagrams

.2 Detailed Bill of Material list for each system or application, identifying quantities, part numbers, descriptions, and optional features

.3 Details of all interfaces and connections to the work of other trades.

.4 Product data sheets or marked catalog pages including part number, photo and description for all products including software

.2 Control Diagrams:

.1 Use at least one individual sheet for each major system.
.2 System flow diagram with sensing, control and interlock devices shown.
.3 Internal control panel layouts, control panel cover layouts, electrical connections inside control panels.
.4 Ladder type wiring diagrams showing interlock, monitoring and control wiring to and from mechanical and electrical equipment.
.5 Communications wiring schematic drawings indicating interconnections between application specific controllers, custom application controllers, application generic controllers, OWS's and other system peripherals.
.6 Flow chart control sequences.

.3 Descriptive data and sequence of operations for operating users and application software including operator's manual and programmer's manual.

.4 Functional performance test documentation and procedures to be used in commissioning control sequences.

.1 Functional performance test documentation for each system or equipment referenced in Part 3.4 and/or scope of work to include the following:

.1 System or Equipment Identifier or Tag,
.2 List of setpoints,
.3 Verification of inputs and outputs,
.4 Verification of each sequence of operation mode,
.5 Verification of alarms,
.6 Deficiencies found during verification,
.7 Date of testing,
.8 Personnel performing test.

.5 List of component sizes, mounting orientations, capacities and locations for; Valves, damper actuators, pressure taps and temperature well schedules.

.6 Provide installation details and specific instructions for equipment.

.7 Submit drawings indicating specific locations of electrical power to control panels.

.8 Quality assurance submittals: submit following in accordance with Section 01 00 00.

.1 Certificates: submit certificates signed by manufacturer certifying that materials comply with specified performance characteristics and physical properties.
.2 Instructions: submit manufacturer's installation instructions.
.3 Contract Administrator will make available 1 copy of systems supplier's installation instructions.

.9 Maintenance Data and Service:

.1 Provide maintenance data for incorporation into maintenance manuals as specified in section 23 05 00 - Common Work Results for HVAC.
.2 Provide as-built information in accordance with Section 21 05 01 and Section 01 00 00.

.10 Guarantee

.1 Provide a written guarantee stating the controls and instrumentation are guaranteed against faulty material and workmanship for a period of one year from the date of the Certification of Substantial Completion.

.11 Operating Instructions

.1 Provide operating instructions for the heat recovery control system in accordance with the General Conditions of the Contract and include a description of the sequence of operation and "as-built" drawings of the system schematics.

.12 Special servicing conditions and expanded warranty or service Contract proposals.

.13 List of recommended spare parts and calibration tools for Contract Administrator's Maintenance Staff.

1.6 RECORD DOCUMENTATION

.1 Operation and Maintenance Manuals.

.1 Three (3) copies of the Operation and Maintenance Manuals shall be provided to the Contract Administrator's Representative upon completion of the project. The entire Operation and Maintenance Manual shall be furnished on Compact Disc media or USB Flash Drive, and include the following for the Controls 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 Manufacturer’s 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 Interfaces to all third party products and work by other trades

.2 The Operation and Maintenance Manual shall be self-contained, and include all necessary software required to access the product data sheets. Include a logically organized table of contents. Viewer software shall provide the ability to display, zoom, print, and search all documents.

1.7 SCOPE OF WORK

.1 General:

.1 Coordinate with electrical, provide and install dedicated 120V circuit as required for control works; wiring methods to Division 26 standards.

.2 Responsibility for all control wiring and low-voltage panels, mounting and operational commissioning of control related devices and of loose supplied controls provided by others as part of a packaged equipment supply.

.3 Wiring required under this section to be performed by this section except as noted otherwise. Refer to Division 26 for wiring methods and EMT conduit systems required by all wiring performed under this section.

.4 Provide O&M training as noted in 21 05 01 General Provisions – Mechanical.

.2 Design and installation of low voltage, automatic controls for the following systems and equipment:

.1 Air Handling Units, AHU-R600 & AHU-R610,

.2 Exhaust Fans, EF-R601 & EF-R611.

.3 Commissioning of all new and existing (where applicable) control systems including but not limited to correct implementation of control sequences, proper response from physical devices, alarms, schedules, seasonal switch-overs, etc. Contractor will be required to demonstrate on site to the Contract Administrator that the system has been commissioned and is operating correctly under all operating sequences.

1.8 QUALIFICATIONS AND SUPPORT

.1 Controls Manufacturer Minimum Qualifications; demonstrate to City/Contract Administrator not less than 5 years experience in the production of specified products or functionality equivalent products.

.2 The Control Contractor shall provide qualified manpower for a complete control system design, installation and testing and commissioning. Sufficient staff shall be dedicated to the project to ensure its timely execution in accordance with the overall project design and construction schedules.

.3 The Controls Contractor shall be capable of supporting all peripheral functions, including start-up, testing, commissioning and Contract Administrator staff training, as well as providing on-site warranty and maintenance services.

1.9 CODES & STANDARDS

.1 Work, materials, and equipment shall comply with the most restrictive of local, provincial, and federal authorities' codes and ordinances or these plans and specifications. As a minimum, the installation shall comply with current editions in effect 30 days prior to receipt of bids.

1.10 WARRANTY

.1 Standard Material and Labor Warranty:

.1 Provide a one-year labor and material warranty on the Work.

.2 If within twelve (12) months from the date of acceptance of product, upon written notice from the Contract Administrator, it is found to be defective in operation, workmanship or materials, it shall be replaced, repaired or adjusted at the option of the Contractor at the cost of the Contractor.

.3 Maintain an adequate supply of materials within 160 kilometers of the Project site such that replacement of key parts and labor support, including programming. Warranty work shall be done during Contractor's normal business hours.

Part 2 PRODUCTS

2.1 APPROVED MANUFACTURERS

.1 Metasys by Johnson Controls Inc.

2.2 MANUFACTURED ITEMS

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

2.3 STANDALONE THERMOSTAT

.1 The standalone thermostat shall be capable of controlling two- or four-pipe fan coils, cabinet unit heaters, a pressure dependent VAV system, zoning type systems employing reheat including local hydronic reheat valves, or other similar equipment.

.2 The standalone thermostat shall include a 4.2 inch LED backlit touch screen with the following configurable icons.

.1 Home screen configurable icons include:

.1 On/Off icon

.2 Fan override icon

.3 Zone temperature icon
.4 Hold temperature icon
.5 Zone humidity (on applicable models) icon
.6 Occupancy status (on applicable models) icon
.7 Temperature setpoint icon
.8 Alarm icon
.9 Unit status icon
.10 Date/Time icon
.11 Fan override icon

.2 Home screen non-configurable icon includes:
.1 Menu icon

.3 The standalone thermostat shall provide the flexibility to support any one of the following inputs:

.1 Integral indoor air temperature sensor
.2 Analog input for remote air temperature sensing that supports the following sensor types:
.1 Nickel
.2 Platinum
.3 A99B PENN
.4 2.25k ohm NTC
.5 10k ohm NTC
.6 10k ohm NTC Type 3
.3 Universal input that supports the following configurations.
.1 Analog sensor
.2 Cooling when switch is closed
.3 Heating when switch is closed
.4 Remote indoor air temperature sensor
.5 Two configurable binary inputs with the following configurations.
.1 Disabled
.2 Occupancy
.3 Override
.4 Remote PIR
.5 Dirty filter
.6 Service
.7 Fan Lock
.8 Open door
.9 Open window

.4 The standalone thermostat shall provide 4 digit passcode security.

.5 The standalone thermostat shall employ nonvolatile electrically erasable programmable read-only memory (EEPROM) for all adjustable parameters.

.6 The standalone thermostat shall have a temperature accuracy of ±0.9F°/±0.5C° at 70.0°F/21.0°C typical calibrated.

.7 The standalone thermostat shall have a humidity accuracy of ±5% RH from 20 to 80% RH at 50 to 90°F (10 to 32°C.)

.8 Proportional fan coil and zoning applications

.1 The standalone thermostat shall provide the flexibility to support any one of the following fan outputs:

.1 Three speed fan control

.2 Proportional speed fan control configurable from 0 to 10V

.2 The standalone thermostat shall provide the flexibility to support the following valve outputs:

.1 Two proportional configurable from 0 to 10V

.3 The standalone thermostat shall provide the flexibility to adjust the following control parameters:

.1 Adjustable maximum setpoint offset from 0 to 20°F

.2 Adjustable fan on delay from 0 to 120 seconds

.3 Adjustable fan off delay from 0 to 120 seconds

.4 Adjustable minimum reheat on time from 0 to 360 seconds

.5 Adjustable minimum reheat off time from 0 to 360 seconds

.6 Adjustable supply fan minimum command from 0 to 100%

.7 Adjustable supply fan Medium command from 0 to 100%

.8 Adjustable supply fan high command from 0 to 100%

.9 Adjustable reheat minimum damper position from 0 to 100%

.10 Adjustable proportional valve opened voltage from 0 to 10 VDC

.11 Adjustable proportional valve closed voltage from 0 to 10 VDC

.4 Provide Johnson Controls TEC322x or approved equal.

2.4 MISCELLANEOUS DEVICES

.1 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.

2.5 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. Thermistor sensors of 10,000 or 2,250 ohms resistance may be substituted based on the application.
.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	+ .5°F
Room Temp	+ .5°F
Duct Temperature	+ .5°F
All Others	+ .75°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 warmer/cooler
.2 Individual heating/cooling setpoint
.3 Momentary override request for activation of after-hours operation
.4 Analog thermometer

.3 Duct Mount Sensors

.1 Duct mount sensors shall mount in an electrical box through a hole in the duct, positioned to provide ease of accessibility 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 provided.
.4 Duct mount sensors shall be positioned so as to be easily accessible for repair or replacement.

.4 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 continuous averaging sensor or 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.

.4 Duct mount sensors shall be positioned so as to be easily accessible for repair or replacement.

.5 Acceptable Manufacturers: Johnson Controls, Minco.

2.6 STATUS AND SAFETY SWITCHES

.1 General Requirements

.1 Switches shall be provided to monitor equipment status, safety conditions, and generate alarms at the Building Management System (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: Johnson Controls or approved equal

.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 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.

2.7 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

2.8 THERMOSTATS – ELECTRIC

.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.

.2 Acceptable Manufacturers: Penn, Emerson, Honeywell

2.9 SMOKE DETECTORS

.1 Ionization type air duct detectors shall be furnished as specified elsewhere in Division 26 for installation under Division 23. All wiring for air duct detectors shall be provided under Division 26, Fire Alarm System.

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 control devices to manufacturers instructions.

.2 Install remote sensing device and capillary tube in rigid, metallic conduit. Conduit enclosing capillary tube must not touch heater or heating cable.

.3 High and low limit thermostats, high-pressure cut-offs, and other safety switches shall be hard-wired to de-energize equipment as described in the sequence of operation. Switches shall require manual reset..

.1 General:

.1 Install sensors according to manufacturer's recommendations.

.2 Mount sensors rigidly and adequately for operating environment.

.3 Air seal wires attached to sensors in their raceways or in the wall to prevent sensor readings from being affected by air transmitted from other areas.

.4 Thermostats & Space Sensors:

.1 Install thermostat 55” – 59” (1400 – 1500 mm) above finished floor

.2 On outside walls, mount thermostats on standoff brackets or insulated pad 1” (25mm) from exterior wall.

.3 Install room temperature sensors on concealed junction boxes properly supported by wall framing.

.5 Control Wiring

.1 All conduit, wiring, accessories and wiring connections required for the installation of the controls, as herein specified, shall be provided by the Contractor unless specifically shown on the Electrical Drawings under Division 24 Electrical. All wiring shall comply with the requirements of

applicable portions of Division 24 and all local and national electric codes, unless specified otherwise in this section.

.2 All wiring materials and installation methods shall comply with manufacturer recommendations.

.3 The sizing, type and provision of cable, conduit, cable trays, and raceways shall be the design responsibility of the Contractor. If complications arise, however, due to the incorrect selection of cable, cable trays, raceways and/or conduit by the Contractor, the Contractor shall be responsible for all costs incurred in replacing the selected components.

.4 Class 2 Wiring

.1 All Class 2 (24 VAC 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 24 VAC 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.

.6 Line Voltage Power Source

.1 120-volt AC circuits used for the controls shall be taken from panel boards and circuit breakers provided by Division 26.

.2 Circuits used for the controls shall be dedicated to the contorls and shall not be used for any other purposes.

.7 Control Wiring 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 Contract Administrator.

.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.

.8 Penetrations

.1 Provide fire stopping for all penetrations used by dedicated controls 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.

.9 Controls Identification Standards

.1 Cable types shall be color coded for easy identification and troubleshooting.

.10 Control Panel Installation

.1 The control 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 Contractor shall be responsible for coordinating panel locations with other trades and electrical and mechanical Contractors.

.11 Input Devices

.1 All Input devices shall be installed per the manufacturer recommendation.
.2 Locate components of the controls in accessible local control panels wherever possible.

.12 HVAC Input Devices – General

.1 All Input devices shall be installed per the manufacturer recommendation.
.2 Locate components of the controls 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 Building Differential Air Pressure Applications (-0.5" to +0.5" WC)

.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.

.6 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.

.7 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 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 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 PROJECT SPECIFIC REQUIREMENTS

.1 The Contractor shall provide but not necessarily be limited to the design, network management, device and controller materials supply, installation, start-up and commissioning for the systems as illustrated and herein described.

.2 Responsibility for mounting and connecting including providing required wiring methods for control devices, remote control panels, etc. that are supplied lose with packaged equipment.

.3 Mechanical Systems Minimum Control & Control Panel Function:

.1 Control to design sequence of operation,
.2 Status Displays,
.3 Alarming.

.4 As a minimum all control wiring shall be run in EMT conduit, unless otherwise dictated by Code. The more restrictive requirements shall apply.

.5 All equipment shall be capable of operating independent of controls to facilitate maintenance and testing in HAND mode.

.6 Device Listing:

.1 Air Handling Unit Packaged Controls,
.2 Exhaust Fans,
.3 Thermostats.

3.4 SEQUENCE OF OPERATION

.1 Air Handling Units, AHU-R600 & AHU-R610:

.1 Air handing units shall be interlocked with corresponding exhaust fan.
.2 Supply fan shall be continuously enabled.
  .1 Supply fan shall be proven with an air flow switch.
  .2 If supply fan is not enabled, corresponding exhaust fan shall be disabled.
.3 Electric Heating Coil:
  .1 Electric Heating Coil shall be enabled when outdoor intake air temperature falls below 15°C (Adjustable).
  .2 Packaged controls shall modulate to maintain a discharge air temperature of 20°C (Adjustable).
  .3 If discharge air temperature falls below 10°C (Adjustable), alarm shall sound.

.2 Exhaust Fans, EF-R601 & EF-611:

.1 Exhaust fan shall be continuously enabled.

3.5 NAMEPLATES

.1 Nameplates shall be provided for all control items listed or shown in the submittal and approved control diagrams.

.2 Each inscription shall identify its function, such as "mixed air controller", "cold deck sensor" in official languages etc. and when applicable, its position.

.1 Size of nameplates shall be 1 inch by 3 inches minimum.
.2 Lettering shall be minimum ¼ inch high normal black lettering.

.3 Submit duplicate samples of identification tags and lists of wording proposed for approval.

3.6 TESTING, COMMISSIONING, & VERIFICATION

.1 Test all field end devices throughout proper input/output ranges.

.2 Testing shall be complete, detailed and documented on approved point-to-point verification forms.

.3 All field calibration must be done with calibrated instrumentation tools suitable for their intended use. Calibration tools shall be calibrated before and after project completion and reports of same submitted to the Project Manager.

.4 Testing and documentation criteria:

.1 Verify that all field devices are properly sized, for anticipated operating range. Devices are adjusted for correction position, orientation and full range.

.2 Conductor Integrity; test continuity of all wiring from field devices to correct input/output.

.3 Conductor Termination; verify that all wiring terminations to devices are per the manufacturer's recommendations.

.4 Conductor to Output; test linear scaling calibration of every analog output point.

.5 Alarm Graphics and interlocking; verify all alarm signals from devices initiation through all required notification components.

.5 Device Calibration; all field devices shall be calibrated, sensor accuracy verified. Calibration shall be done at or close to normal operating conditions.

.1 Calibration Criteria; establish calibration criteria suitable for the intended system function. Suggested HVAC/R calibration criteria;

.1 Space temperature, +/- 0.5 degrees Celsius.

.2 Duct/unit air temperature, +/- 0.5 degrees Celsius.

.3 Fluid temperature, +/- 1 degree Celsius.

.4 Air flow rate, +/- 5%.

.5 Liquid flow rate, +/- 5%.

.6 Differential pressure, +/- 3%.

.7 Static pressure, +/- 3%.

.8 Relative humidity, +/- 2%.

.9 CO monitoring, +/- 3%.

.10 monitoring, +/- 3%.

.11 Refrigerant monitoring, +/- 5%.

.6 Functional Performance Testing:

.1 Comprehensive functional performance testing shall be performed on every system installation. Testing shall include verification of sequences within control software, as well as verification that physical devices respond correctly to the sequences within the software.

.2 The Contractor shall test and document that all logic control sequences have been verified as detailed on the Shop Drawing control sequences. Functional testing shall be documented on forms indicating the date of the testing and personnel performing the testing.

.3 Deficiencies resulting from the functional testing shall be resolved by the Contractor as soon as possible.

.4 System functional testing shall be repeated until successful system test can be documented.

.7 Demonstrations and Training:

.1 Following completion of functional performance testing, demonstration shall commence as follows:

.1 Contractor shall meet the Contract Administrator or their representatives on site to review the controls system. The review shall include, but not limited to:

.1 Review of control sequences,

.2 Verifying physical control devices operate as intended.

.2 Contractor shall demonstrate control sequences are correct, and equipment is being controlled to suit the sequence of operations.

3.7 CLEANING

.1 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 Supply and installation of ductwork, joints and accessories as shown on the drawings.

1.2 REFERENCES

.1 American Society of Heating, Refrigerating and Air-Conditioning Engineers, Inc. (ASHRAE).

.2 American Society for Testing and Materials International, (ASTM).

.1 ASTM A480 / A480M, Standard Specification for General Requirements for Flat-Rolled Stainless and Heat-Resisting Steel Plate, Sheet and Strip.
.2 ASTM A635 / A635M, Standard Specification for Steel, Sheet and Strip, Heavy-Thickness Coils, Carbon, Hot Rolled.
.3 ASTM A653 / A653M, Standard Specification for Steel Sheet, Zinc Coated (Galvanized) or Zinc-Iron Alloy Coated (Galvannealed) by the Hot-Dip Process.

.3 Department of Justice Canada (Jus).

.1 Canadian Environmental Protection Act (CEPA)

.4 Health Canada / Workplace Hazardous Materials Information System (WHMIS)

.1 Material Safety Data Sheets (MSDS).

.5 National Fire Protection Association (NFPA).

.1 NFPA 90A, Standard for the Installation of Air-Conditioning and Ventilating Systems.
.2 NFPA 90B, Standard for the Installation of Warm Air Heating and Air-Conditioning Systems.
.3 NFPA 96, Standard for Ventilation Control and Fire Protection of Commercial Cooking Operations.

.6 Sheet Metal and Air Conditioning Contractors' National Association (SMACNA).

.1 SMACNA HVAC Duct Construction Standards - Metal and Flexible
.2 SMACNA Rectangular Industrial Duct Construction Standard
.3 SMACNA Round Industrial Duct Construction Standard

.7 National Research Council Canada

.1 National Building Code of Canada.
.2 National Energy Code of Canada for Buildings.

.8 Underwriters' Laboratories Inc. (UL)

.1 UL 181, Standard for Factory-Made Air Ducts and Air Connectors

.9 Underwriters' Laboratories of Canada (ULC)

.1 CAN/ULC-S110, Fire Tests for Air Ducts

1.3 ACTION AND INFORMATIONAL SUBMITTALS

.1 Submit shop drawings and product data in accordance with Section 21 05 01 – General Provisions – Mechanical.

.2 Product Data:

.1 Indicate:

.1 Thermal properties.

.2 Friction losses.

.3 Acoustical loss.

.4 Leakage.

.5 Fire rating.

1.4 QUALITY ASSURANCE

.1 Certification of Ratings:

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

1.5 DELIVERY, STORAGE AND HANDLING

.1 Protect on site stored or installed absorptive material from moisture damage.

.2 Store and manage hazardous materials in accordance with applicable regulations.

Part 2 PRODUCT

2.1 DUCTWORK

.1 Galvanized steel:

.1 Z90 designation zinc coating, lock forming quality: to ASTM A 653/A 653M.
.2 Thickness, fabrication and reinforcement: to SMACNA.
.3 Joints: to SMACNA.

2.2 FITTINGS

.1 Fabrication: to SMACNA.

.2 Radiused elbows:

.1 Rectangular: smooth radius, centerline radius 1.5 times width of duct.
.2 Round: smooth radius, centerline radius of 1.5 times diameter.

.3 Mitred elbows, rectangular:

.1 To 16" (400 mm): with single thickness turning vanes, 1.5" vane spacing.
.2 Over 16" (400 mm): with double thickness turning vanes, 2.125" vane spacing.
.3 Turning vanes and runners constructed according to SMACNA standards.

.4 Branches:

.1 Rectangular main and branch: with radius on branch 1.5 times width of duct, 45° entry on branch.
.2 Round main and branch: enter main duct to 45° with conical connection.
.3 Provide volume control damper in branch duct near connection to main duct.
.4 Main duct branches: with splitter damper.

.5 Transitions:

.1 Diverging: 20° maximum included angle.
.2 Converging: 30° maximum included angle.

.6 Offsets:

.1 Full radiused elbows.

.7 Obstruction deflectors: maintain full cross-sectional area.

2.3 SEAL CLASSIFICATION

.1 Classification as follows:

Maximum Pressure Pa	SMACNA Seal Class
500	A

.2 Seal classification:

.1 Class A: longitudinal seams, transverse joints, duct wall penetrations and connections made airtight with sealant and tape.

2.4 SEALANT

.1 Sealant; oil resistant, polymer type fame resistant duct sealant. Temperature range of minus 30° C to plus 93° C.

.2 Acceptable material: Ductmate Proseal/Fibreseal or approved equal.

2.5 FLEXIBLE DUCTS

.1 General:

.1 Factory fabricated to CAN/ULC-S110.

.2 Pressure drop coefficients listed below are based on relative sheet metal duct pressure drop coefficient of 1.00.

.3 Flame spread rating not to exceed 25. Smoke developed rating not to exceed 50

.2 Non-Metallic – Uninsulated:

.1 Non-collapsible, coated mineral base fabric type mechanically bonded to, and helically supported by, external steel wire, as indicated.

.2 Performance:

.1 Factory tested to 2.5 kPa without leakage.

.2 Maximum relative pressure drop coefficient: 3.0

.3 Non-Metallic – Insulated:

.1 Non-collapsible, coated mineral base fabric type mechanically bonded to, and helically supported by, external steel wire with factory applied, 1.5" thick flexible mineral fibre thermal insulation with vapour barrier and vinyl jacket, as indicated.

.2 Performance:

.1 Factory tested to 2.5 kPa without leakage.

.2 Maximum relative pressure drop coefficient: 3.0

2.6 FIRE STOPPING

.1 Retaining angles around duct, on both sides of fire separation in accordance with Section 07 84 00 Firestopping.

.2 Fire stopping material and installation must not distort duct.

2.7 HANGERS AND SUPPORTS

.1 Strap hangers: of same material as duct but next sheet metal thickness heavier than duct.

.1 Maximum size duct supported by strap hanger: 20 in.

.2 Hanger configuration: to SMACNA.

.3 Hangers: galvanized steel angle with galvanized steel rods to SMACNA following table:

Duct Size (mm)	Angle Size (mm)	Rod Size (mm)
up to 750	25x25x3	6
751 to 1050	40x40x3	6
1051 to 1500	40x40x3	10
1501 to 2100	50x50x3	10
2101 to 2400	50x50x5	10
2401 and over	50x50x6	10

.4 Upper hanger attachments:

.1 For steel joist: manufactured joist clamp or steel plate washer.
.2 For steel beams: manufactured beam clamps.
.3 For wood framing: 3" (75 mm) long, galvanized lag screws, fastened to structural framing.
.4 For concrete: manufactured concrete inserts.

Part 3 EXECUTION

3.1 GENERAL

.1 Do work in accordance with SMACNA.

.2 Do not break continuity of insulation vapour barrier with hangers or rods.

.3 Support risers in accordance with SMACNA as indicated/where applicable.

.4 Install breakaway joints in ductwork on sides of fire separations.

.5 Install proprietary manufactured flanged duct joints in accordance with manufacturer's instructions.

.6 Balancing dampers on all branch supply run-outs.

3.2 HANGERS

.1 Strap hangers: install in accordance with SMACNA.

.2 Angle hangers: complete with locking nuts and washers.

.3 Hanger spacing: in accordance with SMACNA as follows:

Duct Size (mm)	Spacing (mm)
to 1500	3000
1525 and over	2500

3.3 WATERTIGHT DUCT

.1 Provide watertight duct for:

.1 Fresh air intakes.
.2 Exhaust air roof and wall penetrations.
.3 Dishwasher exhaust.
.4 Minimum 10 ft (3000 mm) from duct mounted humidifier in all directions.

.2 Form bottom of horizontal duct without longitudinal seams.

.1 Solder or weld joints of bottom and side sheets.
.2 Seal all other joints with duct sealer.

.3 Slope horizontal branch ductwork down towards hoods served.

.1 Slope header ducts down toward risers.

3.4 STAINLESS STEEL DUCT

.1 Weld all joints of stainless steel ductwork to be airtight in conformance with SMACNA Rectangular Industrial Duct Construction Standards or SMACNA Round Industrial Duct Construction Standards.

3.5 FLEXIBLE DUCTS

.1 Duct Installation:

.1 Install in accordance with NFPA 90A or NFPA 90B.

.2 Locations:

.1 Install flexible duct for each supply air diffuser. Length: 3 – 5 ft.

3.6 KITCHEN EXHAUST SYSTEMS

.1 Install to NFPA 96.

3.7 SEALING AND TAPING

.1 Apply sealant to outside of joint to manufacturer's recommendations.

END OF SECTION

Part 1 GENERAL

1.1 SUMMARY

.1 Section Includes:

.1 Materials and Installation for duct accessories including flexible connections, access doors, vane and collars.

1.2 REFERENCES

.1 Health Canada/Workplace Hazardous Materials Information System (WHMIS)

.1 Material Safety Data Sheets (MSDS).

.2 Sheet Metal and Air Conditioning Contractors' National Association (SMACNA)

.1 SMACNA – HVAC Duct Construction Standards – Metal and Flexible.

1.3 ACTION AND INFORMATIONAL SUBMITTALS

.1 Submittals in accordance with Section 21 05 01 General Provisions – Mechanical.

.2 Product Data:

.1 Submit manufacturer's printed product literature, specifications and data sheet. Indicate the following:

.1 Flexible connections

.2 Duct access doors.

.3 Turning vanes

.4 Instrument test ports

.3 Test Reports: submit certified test reports from approved independent testing laboratories indicating compliance with specifications for specified performance characteristics and physical properties.

.1 Certification of ratings: catalogue or published rating shall be those obtained from tests carried out by manufacturer or independent testing agency signifying adherence to codes and standards.

.4 Certificates: submit certificates signed by manufacturer certifying that materials comply with specified performance characteristics and physical properties.

.5 Instructions: submit manufacturer's installation instructions.

.6 Closeout submittals: submit maintenance and engineering data for incorporation into manual specified in Section 21 05 01 General Provisions – Mechanical.

1.4 DELIVERY, STORAGE, AND HANDLING

.1 Remove from site and dispose of packaging materials at appropriate recycling facilities.

Part 2 PRODUCTS

2.1 GENERAL

.1 Manufacture in accordance with SMACNA – HVAC Duct Construction Standards.

2.2 FLEXIBLE CONNECTIONS

.1 Frame: galvanized sheet metal frame with fabric clenched by means of double locked seams.

.2 Material:

.1 Fire resistant, self-extinguishing, neoprene coated glass fabric, temperature rated at -40°C to +90°C, density of 1.3 kg/m^2.

2.3 ACCESS DOORS IN DUCTS

.1 Non-insulated ducts: sandwich construction of same material as duct, one sheet metal thickness heavier, minimum 0.6 mm thick complete with sheet metal angle frame.

.2 Insulated ducts: sandwich construction of same material as duct, one sheet metal thickness heavier, minimum 0.6 mm thick complete with sheet metal angle frame and 25 mm thick rigid glass fiber insulation.

.3 Gaskets: foam rubber.

.4 Hardware:

.1 Up to 300 x 300 mm: 2 sash locks.
.2 301 to 450 mm: 4 sash locks.
.3 451 to 1000 mm: piano hinge and minimum 2 sash locks.
.4 Hold open devices.

.5 Insulated ducts: insulated doors sandwich construction complete with 25 mm thick insulation.

2.4 INSTRUMENT TEST

.1 1.6 mm thick steel zinc plated after manufacture.

.2 Cam lock handles with neoprene expansion plug and handle chain.

.3 28 mm minimum inside diameter. Length to suit insulation thickness.

.4 Neporene mounting gasket.

2.5 SPIN-IN COLLARS

.1 Conical galvanized sheet metal spin-in collars with lockable butterfly damper.

.2 Sheet metal thickness to corresponding round duct standards.

Part 3 EXECUTION

3.1 MANUFACTURER'S INSTRUCTIONS

.1 Compliance: comply with manufacturer's written recommendations of specifications, including product technical bulletins, handling, storage and installation instructions, and data sheet.

3.2 INSTALLATION

.1 Flexible connections:

- .1 Install in following locations:
  - .1 Inlets and outlets to all fans.
- .2 Length of connection: 100 mm.
- .3 Minimum distance between metal parts when system in operation: 75 mm.
- .4 Install in accordance with recommendations of SMACNA.
- .5 When fan is running:
  - .1 Ducting on each side of flexible connection to be in alignment.
  - .2 Ensure slack material in flexible connection.

.2 Access doors:

- .1 Size:
  - .1 Minimum 600 x 1800 mm for person size entry.
  - .2 Minimum 305 x 152 mm for servicing entry.
- .2 Location:
  - .1 Fire and smoke dampers
  - .2 At control dampers.
  - .3 At reheat coils (upstream).
  - .4 At devices requiring maintenance.
  - .5 Locations required by code.
  - .6 Elsewhere as indicated.

.3 Instrument Test Ports:

- .1 General:
  - .1 Install in accordance with recommendations of SMACNA and in accordance with manufacturer's instructions.
- .2 Locate to permit easy manipulation of instruments.
- .3 Install insulation port extensions as require.
- .4 Locations:
  - .1 For traverse readings:
    - .1 Ducted inlets to roof and wall exhausters.
    - .2 Inlets and outlets of other fan systems.
    - .3 Main and sub-main ducts.

.2 For temperature readings:

.1 At outside air intakes.

.2 In mixed air applications in locations approved by Contract Administrator.

.3 At inlet and outlet of coils.

.4 Downstream of junctions of two converging air streams of different temperatures.

3.3 CLEANING

.1 Perform cleaning operations 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 Balancing dampers for mechanical forced air ventilation and air conditioning systems.

1.2 REFERENCES

.1 Sheet Metal and Air Conditioning National Association (SMACNA)

.1 SMACNA HVAC Duct Construction Standards, Metal and Flexible.

.2 Health Canada/Workplace Hazardous Materials Information System (WHMIS)

.1 Material Safety Data Sheets (MSDS)

1.3 ACTION AND INFORMATIONAL SUBMITTALS

.1 Product Data:

.1 Submit manufacturer's printed product literature, specifications and datasheet in accordance with Section 21 05 01 General Provisions – Mechanical. Include product characteristics, performance criteria, and limitations.

.2 Quality assurance submittals: submit following in accordance with Section 01 33 00 – Submittal Procedures.

.1 Certificates: submit certificates signed by manufacturer certifying that materials comply with specified performance characteristics and physical properties.

.2 Instructions: submit manufacturer's installation instructions.

Part 2 PRODUCTS

2.1 GENERAL

.1 Manufacture to SMACNA standards.

2.2 SPLITTER DAMPERS

.1 Fabricate from same material as duct but one sheet metal thickness heavier, with appropriate stiffening.

.2 Single thickness construction.

.3 Control rod with locking device and position indicator.

.4 Rod configuration to prevent end from entering duct.

.5 Pivot: piano hinge.

.6 Folded leading edge.

2.3 SINGLE BLADE DAMPERS

.1 Fabricate from same material as duct, but one sheet metal thickness heavier. V-groove stiffened.

.2 Size and configuration to recommendations of SMACNA, except maximum height 6 in.

.3 Locking quadrant with shaft extension to accommodate insulation thickness.

.4 Inside and outside bronze end bearings.

.5 Channel frame of same material as adjacent duct, complete with angle stop.

2.4 MULTI-BLADED DAMPERS

.1 Damper frame shall be 16 ga. galvanized steel formed into a 5” x 1” structural hat channel. Top and bottom frame members on dampers less than 17 in. high shall be low profile design to maximize the free area of these smaller dampers. Frame shall be 4-piece construction with 1 ½ in. (minimum) integral overlapping gusset reinforcements in each corner to assure square corners and provide maximum resistance to racking.

.2 Damper blades shall be 16 ga. galvanized steel strengthened by three longitudinal 1” deep V-grooves running the entire length of each blade. Each blade shall be symmetrical relative to its axle pivot point, presenting identical performance characteristics with air flowing in either direction through the damper. Provide symmetrical blades of varying size as required to completely fill the damper opening.

.3 Blade orientation is horizontal. Blade operation is opposed.

.4 Each blade stop (at top and bottom of damper frame) shall occupy no more than ½ in. of the damper opening area to allow for maximum free area and to minimize pressure loss across the damper.

.5 Linkage: concealed in jamb, plated steel material.

.6 Axles: minimum ½” diameter, plated steel.

.7 Axle bearings shall be bronze rotating in polished extruded holes in the damper frame.

.8 Acceptable Product: Greenheck model MBD-15 or approved equal.

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 where indicated.

.2 Install in accordance with recommendations of SMACNA and in accordance with manufacturer's instructions.

.3 Locate balancing dampers in each branch duct for supply, return and exhaust systems.

.4 On main supply duct trunks requiring balancing dampers (where noted on drawings) provide necessary transitions with multi-blade balancing damper.

.5 Runouts to registers and diffusers: install single blade damper located as close as possible to main ducts.

.6 All dampers to be vibration free.

.7 Ensure all damper operators are observable and accessible.

.8 Corrections and adjustments conducted by Air Balancing Contractor.

3.3 CLEANING

.1 Proceed in accordance with Section 21 05 01 General Provisions – Mechanical.

.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 Operating dampers for mechanical forced air ventilation and air conditioning systems.

1.2 REFERENCES

.1 American Society for Testing and Materials International (ASTM)

.1 ASTM A653 / A653M, Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by Hot Dip Process.

.2 Health Canada/Workplace Hazardous Materials Information System (WHMIS)

.1 Material Safety Data Sheets (MSDS).

1.3 ACTION AND INFORMATION SUBMITTALS

.1 Product Data:

.1 Submit manufacturer's printed product literature, specification and datasheet in accordance with Section 21 05 01 General Provisions – Mechanical. Include product characteristics, performance criteria, and limitations.

.2 Quality assurance submittals: submit following in accordance with Section 21 05 01 General Provisions – Mechanical.

.1 Certificates: submit certificates signed by manufacturer certifying that materials comply with specified performance characteristics and physical properties.

.2 Instructions: submit manufacturer's installation instructions.

.3 Closeout Submittals

.1 Provide maintenance data for incorporation into manual specified in Section 21 05 01 General Provisions – Mechanical.

1.4 QUALITY ASSURANCE

.1 Certificates:

.1 Catalogued or published ratings those obtained from tests carried out by manufacturer from independent testing agency.

1.5 DELIVERY, STORAGE, AND HANDLING

.1 Deliver, store and handle materials in accordance with manufacturer's written instructions.

Part 2 PRODUCTS

2.1 MOTORIZED DAMPER, INSULATED

.1 Extruded aluminum damper frame shall not be less than 0.080” (2.03 mm) in thickness. Damper frame shall be 4” (101.6 mm) deep x 1" (25.4 mm), with duct mounting flanges on both sides of frame. Frame to be assembled using zinc-plated steel mounting fasteners. Welded frames shall not be acceptable.

.2 Entire frame shall be thermally broken by means of polyurethane resin pockets complete with thermal cuts.

.3 Blades shall be maximum 6" (152.4 mm) deep extruded aluminum (6063-T5) air-foil profiles with a minimum wall thickness of 0.06” (1.52mm). Blades shall be internally insulated with expanded polyurethane foam and shall be thermally broken. Complete blade shall have an insulating factor of R-2.29. All blades shall be symmetrically pivoted.

.4 Blade seals shall be extruded silicone, secured in an integral slot within the aluminum blade extrusions and shall be mechanically fastened to prevent shrinkage and movement over the life of the damper. Adhesive or clip-on type blade seals will not be approved.

.5 Frame seals shall be extruded silicone, secured in an integral slot within the aluminum frame extrusions and shall be mechanically fastened to prevent shrinkage and movement over the life of the damper. Metallic compression type jamb seals will not be approved.

.6 Bearings shall be a dual bearing system composed of a Celcon inner bearing (fixed around a 7/16" (11.11 mm) aluminum hexagon blade pivot pin), rotating within a polycarbonate outer bearing inserted in the frame. Single axle bearing, rotating in an extruded or punched hole shall not be acceptable.

.7 Hexagonal control shaft shall be 7/16" (11.11 mm). It shall have an adjustable length and shall be an integral part of the blade axle. A field-applied control shaft shall not be acceptable. All parts shall be zinc-plated steel.

.8 Linkage hardware shall be aluminum and corrosion-resistant zinc-plated steel, installed in the frame side, out of the airstream, and accessible after installation. Linkage hardware shall be complete with cup-point trunnion screws to prevent linkage slippage and a Celcon bearing between moving parts to reduce wear and increase longevity. Linkage that consists of metal rubbing metal will not be approved.

.9 Dampers shall be designed for operation in temperatures ranging from -40°F (-40°C) to 212°F (100°C).

.10 Dampers shall be AMCA rated for Leakage Class 1A at 1 in w.g. (0.25 kPa) static pressure differential. Standard air leakage data to be certified under the AMCA Certified Ratings Program.

.11 Dampers shall be custom made to required size, with blade stops not exceeding 1¼" (31.7 mm) in height. The blade stop shall be a continuous and integral part of the head/sill. Welded and caulked blade stops shall not be acceptable.

.12 Damper Blade Action:

.1 Opposed blade action for mixing or modulating applications.
.2 Parallel blade action for two position (open, closed) applications.

.13 Dampers shall be Flanged to Duct install type only.

.14 Installation of dampers must be in accordance with manufacturer's instructions.

.15 Field-supplied intermediate structural support is required to resist applied pressure loads for dampers that consist of two or more sections in both height and width. Refer to manufacturer's guidelines.

.16 Provide locking manual actuator for damper actuation.

.17 Acceptable Product:

.1 TAMCO Series 9000 BF or approved equal.

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 where indicated.

.2 Install in accordance with recommendations of SMACNA and in accordance with manufacturer's instructions.

.3 Seal multiple damper modules with silicon sealant.

.4 Install access door adjacent to each damper. See Section 23 33 00 – Air Duct Accessories.

.5 Ensure dampers are observable and accessible.

3.3 CLEANING

.1 Proceed in accordance with Section 21 05 01 General Provisions – Mechanical.

.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 Fans, motors, accessories and hardware for commercial use.

1.2 REFERENCES

.1 Air Conditioning and Mechanical Contractors (AMCA)

.1 AMCA Publication 99, Standards Handbook.
.2 AMCA 300, Reverberant Room Method for Sound Testing of Fans.
.3 AMCA 301, Methods for Calculating Fan Sound Ratings from Laboratory Test Data.

.2 American National Standards Institute (ANSI) / American Society of Mechanical Engineers (ASME)

.1 ANSI/AMCA 210, Laboratory Methods of Testing Fans for Aerodynamic Performance Rating.

.3 National Fire Prevention Association (NFPA)

.1 NFPA 96, Standard for Ventilation Control and Fire Protection of Commercial Cooking Operations.

.4 Canadian General Standards Board (CGSB)

.1 CAN/CGSB 1.181, Ready-Mixed Organic Zinc-Rich Coating.

.5 Health Canada/Workplace Hazardous Materials Information System (WHMIS)

.1 Material Safety Data Sheets (MSDS).

1.3 SYSTEM DESCRIPTION

.1 Performance Requirements:

.1 Catalogued or published ratings for manufactured items: obtained from tests carried out by manufacturer or those ordered by manufacturer from independent testing agency signifying adherence to codes and standards in force.
.2 Capacity: flow rate, static pressure, BHP (W), efficiency, RPM, power, model size, sound power data and as indicated on schedule.
.3 Fans: statically and dynamically balanced, constructed in conformity with AMCA 99.
.4 Sound Ratings: comply with AMCA 301, tested to AMCA 300. Supply unit with AMCA certified sound rating seal.

.5 Performance ratings: based on tests performed in accordance with ANSI/AMCA 210. Supply unit with AMCA certified rating seal, except for propeller fans smaller than 12" diameter.

1.4 ACTION AND INFORMATIONAL SUBMITTALS

.1 Product Data:

.1 Submit manufacturer's printed product literature, specifications and datasheet in accordance with Section 21 05 01 General Provisions – Mechanical. Include product characteristics, performance criteria, and limitations.

.2 Shop Drawings:

.1 Submit shop drawings and product data in accordance with Section 21 05 01 – General Provisions - Mechanical.

.3 Provide:

.1 Fan performance curves showing point of operation, and efficiency.
.2 Sound rating data at point of operation.

.4 Indicate:

.1 Motors, sheaves, bearings, wheels, shaft details and accessories.
.2 Minimum performance achievable with variable speed controllers, when necessary.

.5 Quality assurance submittals: submit following in accordance with Section 01 33 00 – Submittal Procedures.

.1 Certificates: submit certificates signed by manufacturer certifying that materials comply with specified performance characteristics and physical properties.
.2 Instructions: submit manufacturer's installation instructions.

.6 Closeout Submittals:

.1 Provide operation and maintenance data for incorporation into manual specified in Section 21 05 01 General Provisions – Mechanical.

1.5 MAINTENANCE

.1 Furnish list of individual manufacturer's recommended spare parts for equipment, include:

.1 Bearings and seals.
.2 Matched set of belts.
.3 Addresses of suppliers.
.4 List of specialized tools necessary for adjusting, repairing or replacing.

1.6 DELIVERY, STORAGE, AND HANDLING

.1 Deliver, store and handle materials in accordance with manufacturer's written instructions

Part 2 PRODUCTS

2.1 EXHAUST FANS, EF-R601 & EF-R611

.1 General Description:

.1 Base fan performance at standard conditions (density 0.075 Lb/ft3)
.2 Performance capabilities up to 5,025 cubic feet per minute (cfm) and static pressure to 2.0 inches of water gauge
.3 Fans are available in thirteen sizes with nominal wheel diameters ranging from 8 inches through 16 inches (60 - 160 unit sizes)
.4 Normal operating temperature up to 130 Fahrenheit (54.4 Celsius)
.5 Applications include: intake, exhaust, return, or make-up air systems
.6 Each fan shall bear a permanently affixed manufacture's engraved metal nameplate containing the model number and individual serial number

.2 Wheel:

.1 Non-overloading, backward inclined centrifugal wheel
.2 Constructed of Composite
.3 Statically and dynamically balanced in accordance to AMCA Standard 204-05
.4 The wheel cone and fan inlet will be matched and shall have precise running tolerances for maximum performance and operating efficiency
.5 Single thickness blades are securely riveted or welded to a heavy gauge back plate and wheel cone

.3 Motors:

.1 Electronically Commutated Motor

.1 Motor enclosure: TENV
.2 Motor to be a DC electronic commutation type motor (ECM) specifically designed for fan applications. AC induction type motors are not acceptable. Examples of unacceptable motors are: Shaded Pole, Permanent Split Capacitor (PSC), Split Phase, Capacitor Start and 3 phase induction type motors
.3 Motors are permanently lubricated, heavy duty ball bearing type to match with the fan load and pre-wired to the specific voltage and phase
.4 Internal motor circuitry to convert AC power supplied to the fan to DC power to operate the motor

.5 Motor shall be speed controllable down to 20% of full speed (80% turndown). Speed shall be controlled by either a potentiometer dial mounted at the motor or by a 0-10 VDC signal

.6 Motor shall be a minimum of 85% efficient at all speeds

.4 Housing/Cabinet Construction:

.1 Square design constructed of heavy gauge galvanized steel and shall include square duct mounting collars

.2 Housing and bearing supports shall be constructed of heavy gauge bolted and welded steel construction to prevent vibration and to rigidly support the shaft and bearing assembly.

.3 Galvanized Construction material

.5 Housing Supports and Drive Frame:

.1 Housing supports are constructed of structural steel with formed flanges

.2 Drive frame is welded steel which supports the motor

.6 Disconnect Switches:

.1 NEMA rated: NEMA 1: indoor application no water. Factory standard.

.2 Positive electrical shut-off

.3 Wired from fan motor to junction box

.7 Duct Collars:

.1 Square design to provide a large discharge area

.2 Inlet and discharge collars provide easy duct connection

.8 Access Panel:

.1 Two sided access panels, permit easy access to all internal components

.2 Located perpendicular to the motor mounting panel

.9 Performance:

.1 Refer to Schedule on drawings.

.10 Acceptable Product:

.1 Greenheck SQ or Approved Equal.

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 FAN INSTALLATION

.1 Install fans as indicated, according to manufacturer's instructions.

.2 Install flexible connections in accordance with Section 23 33 00 Air Duct Accessories.

.3 Provide sheaves and belts required for final air balance.

.4 Bearings and extension tubes to be easily accessible.

.5 Exhaust fans with speed controls to be wired by electrical.

.6 Kitchen exhaust fans: Install fans in accordance with NFPA 96 requirements.

.7 Access doors and access panels to be easily accessible.

3.3 CLEANING

.1 Proceed in accordance with Section 21 05 01 General Provisions – Mechanical.

.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 Supply, return and exhaust grilles and registers, diffusers and linear grilles, for commercial use.

1.2 SYSTEM DESCRIPTION

.1 Performance Requirements:

.1 Catalogued or published ratings for manufactured items: obtained from tests carried out by manufacturer from independent testing agency signifying adherence to codes and standards.

1.3 ACTION AND INFORMATIONAL SUBMITTALS

.1 Product Data:

.1 Submit product data in accordance with Section 21 05 01 General Provisions – Mechanical.

.2 Indicate the following:

.1 Capacity.

.2 Throw and terminal velocity.

.3 Noise criteria.

.4 Pressure drop.

.5 Neck velocity.

.2 Quality assurance submittals:

.1 Certificates: submit certificates signed by manufacturer certifying that materials comply with specified performance characteristics and physical properties.

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

.3 Instructions: submit manufacturer's installation instructions.

.3 Closeout Documentation:

.1 Provide maintenance data for incorporation into manual specified in Section 21 05 01 General Provisions – Mechanical

1.4 DELIVERY, STORAGE, AND HANDLING

.1 Deliver, store and handle materials in accordance with manufacturer's written instructions.

Part 2 PRODUCTS

2.1 GENERAL

.1 To meet capacity, pressure drop, terminal velocity, throw, noise level, neck velocity.

.2 Frames:

.1 Full perimeter gaskets.
.2 Plaster frames where set into plaster or gypsum board at all locations and as specified.
.3 Concealed fasteners.

.3 Concealed manual volume control damper operators when dampers are specified for grilles, registers and diffusers.

.4 Colour: Allow for premium colour / finish, selected by Architect.

2.2 MANUFACTURED ITEMS

.1 Grilles, registers and diffusers of same generic type to be product of one manufacturer.

2.3 GRILLES, REGISTERS AND DIFFUSERS

.1 Refer to drawings for grille and diffuser sizes and performance schedules.

.2 Acceptable Manufacturers: Price, Nailor, Titus or approved equal.

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 in accordance with manufacturer's instructions.

.2 Install with stainless steel screws in countersunk holes where fastenings are visible.

.3 Bolt grilles, registers and diffusers, in place, in gymnasiums and similar game rooms.

.4 Provide concealed safety chain on each grille, register and diffuser in gymnasiums and similar game rooms, or elsewhere as indicated.

END OF SECTION

Part 1 GENERAL

1.1 SUMMARY

.1 Section Includes:

.1 Mechanical louvers, intakes, vents and reinforcement and bracing for air vents, intakes and gooseneck hoods.

1.2 REFERENCES

.1 American National Standards Institute (ANSI) / National Fire Protection Association (NFPA)

.1 ANSI/NFPA 96, Standard for Ventilation Control and Fire Protection of Commercial Cooking Operations.

.2 American Society for Testing and Materials International (ASTM),

.1 ASTM E 90, Standard Test Method for Laboratory Measurement of Airborne Sound Transmission Loss of Building Partitions and Elements.

.3 Health Canada/Workplace Hazardous Materials Information System (WHMIS)

.1 Material Safety Data Sheets (MSDS)

.4 Sheet Metal and Air Conditioning Contractors' National Association (SMACNA).

1.3 SYSTEM DESCRIPTION

.1 Performance Requirements:

.1 Catalogued or published ratings for manufactured items: obtained from tests carried out by manufacturer or those ordered by manufacturer from independent testing agency signifying adherence to codes and standards.

1.4 ACTION AND INFORMATIONAL SUBMITTALS

.1 Product Data:

.1 Submit manufacturer's printed product literature, specifications and datasheet in accordance with Section 21 05 01 General Provisions – Mechanical. Include product characteristics, performance criteria, and limitations.

.2 Indicate following:

.1 Pressure drop.

.2 Face area.

.3 Free area.

.2 Quality assurance submittals: submit following in accordance with Section 21 05 01 General Provisions – Mechanical.

.1 Certificates: submit certificates signed by manufacturer certifying that materials comply with specified performance characteristics and physical properties.
.2 Instructions: submit manufacturer's installation instructions

.3 Test Reports:

.1 Submit certified data from independent laboratory substantiating acoustic and aerodynamic performance to ASTM E90.

1.5 DELIVERY, STORAGE, AND HANDLING

.1 Deliver, store and handle materials in accordance with manufacturer's written instructions.

Part 2 PRODUCTS

2.1 LOUVERS

.1 Refer to drawings for louver sizes and performance schedules.

.2 Colour: Allow for premium finish/colour, selected by Architect.

.3 Acceptable Manufacturers: Price, Ruskin, or approved equal.

2.2 GOOSENECK HOODS

.1 Thickness: to SMACNA.

.1 Kitchen: to ANSI/NFPA 96
.2 Elsewhere: to SMACNA.

.2 Fabrication: to SMACNA.

.1 Kitchen: to ANSI/NFPA 96
.2 Elsewhere: to SMACNA.

.3 Joints: to SMACNA or proprietary manufactured duct joint. Proprietary manufactured flanged duct joint shall be considered to be a class A seal.

.4 Supports: as indicated.

.5 Complete with integral birdscreen of 2.7 mm diameter stainless steel wire. Use 12 mm mesh on exhaust, 19 mm mesh on intake.

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 and instructions, and datasheet.

3.2 INSTALLATION

.1 In accordance with manufacturers and SMACNA recommendations.

.2 Reinforce and brace air vents, intakes and goosenecks as indicated.

.3 Anchor securely into opening. Seal with caulking all around to ensure weather tightness.

3.3 CLEANING

.1 Proceed in accordance with Section 21 05 01 General Provisions – Mechanical.

.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 REFERENCES

.1 American National Standards Institute/Air-Conditioning and Refrigeration Institute (ANSI/ARI)

.1 ANSI/ARI 430, Central-Station Air-Handling Units.

.2 American Society of Heating, Refrigeration and Air Condition Engineers (ASHRAE)

.1 ANSI/ASHRAE 90.1, (I-P) Energy Standard for Buildings Except Low-Rise Residential Buildings.

.2 ANSI/ASHRAE 52.2, Method of Testing General Ventilation Air-Cleaning Devices for Removal Efficiency by Particle Size.

.3 Canadian General Standards Board (CGSB)

.1 CAN/CGSB 1.181, Ready-Mixed Organic Zinc-Rich Coating.

.4 Green Seal Environment Standards (GSES)

.1 Standard GS-11, Environmental Standard for Paints.

.5 Master Painters Institute (MPI)

.1 MPI-INT 5.3, Galvanized Metal

1.2 ACTION AND INFORMATIONAL SUBMITTALS

.1 Provide submittals in accordance with Section 21 05 01 General Provisions – Mechanical.

.2 Product Data:

.1 Provide manufacturer's printed product literature and datasheets for insulation, filters, adhesives, and paints, and include product characteristics, performance criteria, physical size, finish and limitations.

.3 Shop Drawings:

.1 Indicate following: fan, fan curves showing point of operation, motor drive, bearings, filters, dampers; include performance data.

1.3 CLOSEOUT SUBMITTALS

.1 Provide maintenance data for incorporation into manual specified in Section 21 05 01 General Provisions – Mechanical.

.2 Include following: fan, bearings, motor, damper, air volume, EDB, EWB, OAT, total heating, total cooling, sensible cooling.

1.4 MAINTENANCE MATERIAL SUBMITTALS

.1 Provide maintenance materials in accordance with Section 21 05 01 General Provisions – Mechanical.

.2 Spare filters: in addition to filters installed immediately prior to acceptance by Contract Administrator, supply one complete set of filters for each filter unit or filter bank.

.3 Provide list of individual manufacturer's recommended spare parts for equipment such as bearings and seals, and addresses of suppliers, together with list of specialized tools necessary for adjusting, repairing or replacing, for placement into operating manual.

1.5 DELIVERY, STORAGE AND HANDLING

.1 Deliver, store and handle in accordance with Section 21 05 01 General Provisions - Mechanical.

.2 Deliver materials to site in original factory packaging, labeled with manufacturer's name, address.

Part 2 PRODUCTS

2.1 GENERAL

.1 Air handling unit shall be built to the level of quality as herein specified and to the description of the Air Handling Unit Schedule.

.2 Substitution of any product other than that specified must assure no deviation below the stated capacities, airflow rate, heat transfer rate, filtration efficiency and air mixing quality. Power requirements must not be exceeded. Applications for “equal” or “alternate” must address these factors.

.3 Pre-wired air handling units shall bear an approved label with all the necessary identification marks, electrical data, and any necessary cautions as required by the Canadian Electrical Code.

.4 All equipment shall be factory tested prior to shipment.

2.2 AIR HANDLING UNIT, AHU-R600 & AHU-R610

.1 GENERAL:

.1 Air handling unit shall be designed to pull in fresh air from outside a building in order to replace existing air and continuously provide comfortable ventilation throughout the building.

.2 FRAME MATERIAL:

.1 The frame of the compact make-up air unit is made of galvanized steel of suitable gauge according to the voltage and kW of the unit.

.3 CONTROL:

.1 Monitor alarms for faulty or disconnected temperature sensors, tripped thermal cutouts or other fault conditions
.2 Recommended control with a duct temperature sensor to capitalize on the full range of ECM modulation
.3 Set fan speed and temperature setpoints on the main board or from the optional thermostat
.4 Real time display of temperature (from room or duct) and setpoint
.5 IAQ control based on CO2 level and optional synchronization to start exhaust fans
.6 Static pressure PID algorithms, control of fresh air and return air
.7 Multi-exhaust fan synchronizer control
.8 Included Options:

.1 Control of modulating or on/off dampers
.2 Outside air and supply air duct sensor algorithms
.3 Board and SSR temperature sensors for added protection
.4 BMS integration via BACnet MS/TP

.9 7-day programmable scheduler accessible using BACnet communication, with interlock based on occupancy status

.4 CENTRIFUGAL FAN:

.1 The ECM centrifugal fan is suitable for applications with higher restriction on the filter, duct or zoning requirements, which result in a higher pressure drop.

.5 HEATING ELEMENTS:

.1 The heating elements of the unit are made of high-grade nickel chromium wire supported by ceramic bushings.

.6 THERMAL PROTECTION:

.1 The thermal cutouts stops the CMU if a high-temperature condition is detected. Neptronic patented EAS algorithm control is incorporated in the design.

.7 ELEMENT MODULATION CONTROL:

.1 Uses Thyristors to control the heater output to maintain the desired temperature setpoint. Vernier control may also be used based on the kW and voltage of the unit.

.8 FILTER:

.1 MERV8, replaceable, pre-filter is embedded into the unit.

.9 PERFORMANCE

.1 Refer to Schedule on drawings.

.10 ACCEPTABLE PRODUCT

.1 Neptronic CMU or Approved Equal.

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 INSTALLATION

.1 Provide appropriate protection apparatus.

.2 Install units in accordance with manufacturer's instructions and as indicated.

.3 Ensure adequate clearance for servicing and maintenance.

3.3 FANS

.1 Install fan sheaves required for final air balance. Additional fan sheaves shall be provided by the supplier and installed by the Contractor if required to achieve proper air balance.

.2 Install flexible connections at fan inlet and fan outlets.

.3 Install vibration isolators.

3.4 DRIP PANS

.1 Install deep seal P-traps on drip lines.

.2 Depth of water seal to be 1.5 times static pressure at trap.

3.5 FIELD QUALITY CONTROL

.1 Provide factory trained representative to provide training and perform an Office of the Fire Commissioner Inspections and Technical Services Manitoba (OFC-ITSM) supervised start-up,

.2 Manufacturer's Field Services:

.1 Have manufacturer of products supplied under this Section review work involved in 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 on which work of this Section depends is complete, but before installation begins.

.2 Upon completion of work, after cleaning is carried out.

.3 Obtain reports within 3 days of review and submit immediately to Contract Administrator.

.4 Verify accessibility, serviceability of components including motorized dampers, filters coils, fans, motors, operators, sensors, electrical disconnects.

.5 Verify accessibility, cleanability, drainage of condensate drains.

.6 Performance Verification:

.1 Air Handling Units:

.1 Check for smooth, vibration less correct rotation of supply fan impeller.

.2 Measure supply fan capacity.

.3 Adjust impeller speed as necessary and repeat measurement of fan capacity.

.4 Measure pressure drop each component of air handling unit.

.5 Set outside air and return air dampers for the % of outside air required by design and repeat measurements of fan capacity.

.6 Reduce differences between fan capacity at minimum and maximum outside air less than 5%.

.7 OAD: verify for proper stroking, interlock with RAD.

.8 Measure DBT, WBT of SA, RA, EA.

.9 Measure flow rates (minimum and maximum) of SA, RA, EA, relief air.

.10 Simulate maximum heating load and:

.1 Verify temperature rise across heat exchanger.

.2 Perform flue gas analysis. Adjust for peak efficiency.

.3 Verify combustion air flow to heat exchanger.

.4 Simulate minimum heating load and repeat measurements.

.11 Verify operating control strategies, including:

.1 Heat exchanger operating and high limit.

.2 Freeze protection.

.3 Economizer cycle operation, temperature of change-over.

.4 Alarms.

.5 Voltage drop across thermostat wiring.

.12 Measure leakage past zone mixing dampers by taking temperature measurements. Reduce leakage to less than 5%.

.13 Check capacity of heating unit.

.14 Refer to other sections of these specifications for PV procedures for other components.

.7 Commissioning Reports:

.1 In accordance with Section 23 05 93 – TAB of Mechanical System.

3.6 DEMONSTRATION

.1 Training: in accordance with Section 21 05 01 General Provisions – Mechanical.

.2 Contractor to co-ordinate, arrange and pay for Office of Fire Commission inspections.

3.7 CLEANING

.1 Clean in accordance with Section 21 05 01 General Provisions – Mechanical.

END OF SECTION

Part 1 GENERAL

1.1 REFERENCES

.1 CSA International

.1 CSA C22.2 No.46, Electric Air-Heaters.

.2 National Electrical Manufacturers Association (NEMA)

.1 NEMA 250, Enclosures for Electrical Equipment (1000 V Maximum).

1.2 ACTION AND INFORMATIONAL SUBMITTALS

.1 Submit in accordance with Section 21 05 01 General Provisions – Mechanical.

.2 Product Data:

.1 Submit manufacturer's instructions, printed product literature and data sheets for unit heaters and include product characteristics, performance criteria, physical size, finish and limitations.

.3 Manufacturer's Instructions: provide to indicate special handling criteria, installation sequence, cleaning procedures.

1.3 CLOSEOUT SUBMITTALS

.1 Submit in accordance with Section 21 05 01 General Provisions – Mechanical.

.2 Operation and Maintenance Data: submit operation and maintenance data for unit heaters for incorporation into manual in accordance with Section 21 05 01 General Provisions – Mechanical.

1.4 DELIVERY, STORAGE AND HANDLING

.1 Delivery and Acceptance Requirements: deliver materials to site in original factory packaging, labelled with manufacturer’s name and address.

.2 Storage and Handling Requirements:

.1 Store materials off ground, indoors in a dry location and in accordance with manufacturer’s recommendations.
.2 Store and protect unit heaters from nicks, scratches, and blemishes.
.3 Replace defective or damaged materials with new.

Part 2 PRODUCTS

2.1 ELECTRIC UNIT HEATERS, UH

.1 Performance: As Noted on Schedule

.2 Units shall be UL and C-UL listed for safe operation, construction, and performance. Units shall be listed for use in Canada for commercial and industrial wet environment installations.

.3 Casing

.1 18 and 20-gauge steel.
.2 Adjustable louvres to direct air flow.
.3 Epoxy/polyester powder paint.

.4 Heating Element

.1 Durable tubular heating elements, stainless steel.
.2 Concentric disposition of heating elements.

.5 Motor and Propeller Fan

.1 Motor mounted in cold compartment.
.2 Thermally-protected motor.
.3 Totally enclosed and factory-lubricated ball bearing motor.
.4 58 dBA fan.
.5 Fan delay to purge heater of residual heat.

.6 Electrical

.1 Units shall have built-in contactors and control circuit transformers (where required) to provide single-source power connection.
.2 A wiring diagram and a grounding lug shall be included in each power junction box.

.7 Controls

.1 Thermostat to be provided and installed by the Contractor.

.8 Accessories

.1 Adjustable horizontal air deflectors

.9 Approved Product: Ouellet model OAS or approved equal.

Part 3 EXECUTION

3.1 EXAMINATION

.1 Verification of Conditions: verify that conditions of substrate previously installed under other Sections or Contracts are acceptable for unit heaters installation in accordance with manufacturer's written instructions.

.1 Visually inspect substrate.
.2 Inform Contract Administrator 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 Contract Administrator.

3.2 INSTALLATION

.1 Suspend unit heaters from ceiling as indicated.

.2 Install thermostats in suitable location within ceiling space close to unit heater.

.3 Make power and control connections.

3.3 FIELD QUALITY CONTROL

.1 Perform tests in accordance with Section 21 05 01 General Provisions – Mechanical.

.2 Test cut-out protection when air movement is obstructed.

.3 Test fan delay switch to assure dissipation of heat after element shut down.

.4 Test unit cut-off when fan motor overload protection has operated.

.5 Ensure heaters and controls operate correctly.

3.4 PROTECTION

.1 Clean in accordance with 21 05 01 General Provisions – Mechanical.

.2 Protect installed products and components from damage during construction.

.3 Repair damage to adjacent materials caused by unit heaters installation.

END OF SECTION