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SPECIFICATIONS

Issued For Construction

PROJECT No. R.067379/201900076

PUBLIC SERVICES AND PROCUREMENT CANADA (PSPC)
SSC DEPOT
7th Floor, 269 Main Street.
Winnipeg, MB

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DRAWINGS:

ARCHITECTURAL / INTERIOR DESIGN

- A001 TITLE AND INDEX SHEET
- A100 DEMO PLAN & FINISH PLAN – 7th FLOOR
- A200 REFLECTED CEILING PLAN & FURNITURE PLAN – 7th FLOOR

MECHANICAL

- M1.0 FLOOR PLANS - MECHANICAL

ELECTRICAL

- E1.0 ELECTRICAL KEY PLAN AND SYMBOL LEGEND
- E3.0 FLOOR PLANS - ELECTRICAL

APPENDIX C:

COMMISSIONING PLAN	00
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Part 1 General

1.1 RELATED SECTIONS

- .1 This section describes requirements applicable to all sections within Divisions 1 to 99.

1.2 PRECEDENCE

- .1 Refer to Contract Documents

1.3 DESCRIPTION OF WORK

- .1 Special requirements when dealing with or when in contact with the building occupants

1.4 APPOINTMENTS

- .1 There are no appointments expected to be required as a part of this contract.
- .2 Should there be cause for an appointment the Contractor is responsible to arrange and schedule all appointments for occupied spaces 7 days prior to the commencement of any work. Confirm the appointment 72 hrs prior to commencing work.
- .3 Obtain written approval to trespass and to perform the intended works from the customer/tenant prior to the commencement of any works in or about their premises.
- .4 Should the occupant not be able to attend to any appointments the Contractor is to leave a suitable notice on which identifies where the occupant can contact them to arrange for another appointment.
- .5 Should the occupant not attend a second appointment, the Contractor is to immediately inform the Owners Representative in writing.

1.5 DISCUSSIONS WITH THE OCCUPANT

- .1 Maintain courteous discussions with occupant at all times.
- .2 Inform occupants prior to commencement of any work:
 - .1 What work needs to be done;
 - .2 How work will be done;
 - .3 Who will be involved in the performance of the work;
 - .4 How long the work will take to complete;
 - .5 What degree of inconvenience that there might be to the occupant;
 - .6 What safety measures and other protection are being implemented to protect the individual members of the occupant(s);
 - .7 All debris generated from work will be cleaned up prior to leaving.

- .8 Contractors are prohibited from disclosing any information relating to potential future improvements for the said occupant(s).

1.6 CONTRACTORS DUTIES, OBSERVATIONS AND OPINIONS

- .1 The Contractor is to only perform the work of this contract and is not to undertake any work for the occupant while this contract is in effect.
- .2 Should the Contractor observe any aspects of the work to be performed as being defective, ineffective, wasteful, or in any way unacceptable in his view he is not to discuss or in any way indicate any of his opinions with the occupant. Any of these observations are to be brought to the attention of the Owners Representative only.
- .3 At no time is the Contractor to enter into any discussions with the occupant that may leave the occupant with any expectations either positive or negative with respect to the work being performed.

1.7 CONTRACTOR SITE ETIQUETTE

- .1 Contractor's etiquette when working in or about the occupants premises will consist of but not be limited to:
 - .1 Knock on the main door of the occupant and obtain verbal approval prior to commencing work;
 - .2 Offensive language or gestures will not be used;
 - .3 Smoking, drinking or the use of any form of tobacco and cannabis product is not to be used in or about the premises of the occupant;
 - .4 The Contractor is only to use prearranged washroom facilities and is NOT to use the washroom facilities of the occupant;
 - .5 Contractors are responsible to ensure that the workers wear appropriate clothing on all sites (i.e. no torn jeans);
 - .6 Should any confrontation occur with the occupant, terminate discussions immediately and inform the Owners Representative.

1.8 PROTECTION OF PREMISES

- .1 The Contractor shall ensure the health and welfare of the occupant at all times and protect the premises and belongings of the occupant by performing but not limiting himself to the following duties:
 - .1 The work site and access to it is to be kept clean and tidy at all times;
 - .2 Stockpiles of materials, tools or equipment are not to be or on any occupant premises. All materials shall be stored in designated area;
 - .3 Contractor's employees or any individual associated with the Contractor are to park their vehicles in approved locations;

- .4 At the completion of work at each RHU, contractor shall complete a thorough clean-up of any and all contractor's debris. Contractors will note that workers who demonstrate total disregard for National Defence (DND) property or unnecessarily litter the work site, will be required to leave the premises at once.

1.9 MATERIALS, TOOLS AND EQUIPMENT STORAGE

- .1 The Contractor shall ensure the health and welfare of the occupant at all times and protect the premises and belongings of the occupant by performing but not limiting himself to the following duties:
 - .1 The Contractor is to obtain approval of all locations for the storage of materials, tools and equipment from the Owners Representative.
 - .2 CFHA will not be held responsible for any lost, damaged or stolen materials, tools and equipment while stored on DND property.
 - .3 The Contractor is to make arrangements for and supply their own electrical as required for the performance of the intended work. The Contractor may gain permission from the occupant to use the electrical power from the applicable unit, but must have this permission in writing prior to commencing the work.
 - .4 The Contractor may use the electrical available in the unoccupied premises with the approval of the Owners Representative.
 - .5 Exterior hose bibs may be used for work under this project. Contractor is to provide written notice of the use to the occupant 72 hours prior to use. Contractor must use their own hoses, etc. Occupant's property is not to be used.

Part 2 Products

2.1 NOT USED

- .1 Not Used.

Part 3 Execution

3.1 NOT USED

- .1 Not Used.

END OF SECTION

Part 1 General

1.1 WORK COVERED BY CONTRACT DOCUMENTS

- .1 Work of this Contract comprises the furnishing of all labour, materials, equipment and supervision required for an interior renovation and related work as specified and/or indicated for the 7th Floor of 269 Main Street, in Winnipeg, Manitoba.
- .2 This building is a Classified Federal Heritage Building, with the highest level of designation and protection. The FHBRO will review in detail, all work that will occur to the building, both interior and exterior. All existing heritage elements are required to remain, and be protected with the highest level of care during all phases of work, including all demolition and new construction that may occur.
- .3 Overview of the scope of work is as follows; refer to drawings for further information:
 - .1 The project involves the SSC Depot Fit-Up
 - .2 Space includes:
 - .1 Useable area: Partial 7TH floor (40 sq. m)
 - .2 Meet minimum requirements
 - .1 Design and construction industry recognized and tested best practices, standards, and procedures.
 - .2 Design process must meet current conservation methods and procedures based on the *Standards and Guidelines for the Conservation of Historic Places in Canada* as reviewed and accepted by conservation professionals of the FHBRO.
 - .3 Design solution must meet CAN/CSA B651-2012 (Universal Accessibility)
 - .3 Installation of new floors finishes within the tenant fit-up spaces.
 - .4 Work not included in Contract is indicated as N.I.C. on the drawings.

1.2 ASBESTOS ABATEMENT

- .2 Where work of this Contract involves disturbing asbestos containing materials (ABM) stop work immediately and notify Consultant.
- .3 Remove and dispose of ABM in accordance with governing regulations. Refer to Section 01 35 42 – Environmental Procedures.

- .4 Include costs for asbestos abatement in Contract Price, but only for those areas where asbestos abatement is required to perform the work of this Contract.

1.3 WORK BY OTHERS

- .1 Work of Project executed during Work of this Contract, and which is specifically excluded from this Contract:
 - .1 Supply and installation of furniture.
- .2 The Contractor shall for the purpose of the Manitoba Occupational Health and Safety Act and Regulations for Construction Projects, and for the duration of the Work of the Contract:
 - .2 Assume the role of Constructor in accordance with the Authority Having Jurisdictions.
 - .3 Agree, in the event of two or more Contractors working at the same time and space at the work site, without limiting the General Conditions GC3.7, to the Consultant's order to:
 - .1 Assume, as the Constructor, the responsibility for the Consultant's other Contractors.

1.4 DEFINITIONS

- .1 The word "provide" means "supply and install".
- .2 The term "Tenant" means the organization who is, or will be, occupying the building site.
- .3 The term "Owner" means the building site Landlord.
- .4 The term "Building Manager" means Brookfield Global Integrated Solutions Canada LP (BGIS). BGIS provides property management services on behalf of Public Services and Procurement Canada (PSPC).

1.5 WORK SEQUENCE

- .1 Note: Permit to be applied for by the Consultant, and then transferred to G.C. at time of award.
- .2 The building will continue to be occupied during the entire renovation. The Fire Alarm must be kept operational and exits must be clear and free of all obstructions during working hours. Work can take place during regular construction hours (6 am-6pm) if the entire floor is vacant. When work is taking place beside occupied area work must be

completed after hours and a hoarding must be constructed between the floor and under side of the ceiling.

- .3 Limited work is permitted during the day. This work solely includes activities that will not create excessive noise/odour or any additional condition that could adversely affect our staff located within the building. 48 hour advance notice is to be provided to Tenant.
- .4 Coordinate Progress Schedule with Consultant for User Department occupancy during construction.
- .5 Sequence of work shall be as follows:
 - .1 Demolition
 - .2 Renovation
 - .3 Set up furniture (NIC)
 - .4 Make all electrical connections to furniture.
- .6 Maintain fire access/control.
- .7 This contract will include the coordination of site access for PSPC's furniture vendor.
- .8 PSPC will be responsible for coordinating the system furniture contractor directly.
- .9 Contractor to factor in electrical work only related to Furniture Systems.

1.6 TIME OF COMPLETION

- .1 PSPC would like occupancy of the space by March 15th 2020. General contractor to prepare schedule within 2 calendar week of award identifying all phases and timelines associated with each base.
- .2 Work under this contract is to be performed in a timely manner. Commence planning and preparatory work immediately upon receipt of official notification of acceptance of Contract and complete the work within time stipulated in the Construction Tender.
- .3 Before work is undertaken to specific areas, ensure that all materials and trades required are available to finish work in as short a period as possible.

1.7 INTERPRETATION OF DOCUMENTS

- .1 In the event of discrepancies or conflicts in interpreting the Plans (drawings) and Specifications,

- .1 Division 1 Sections take precedence over technical specification sections in other Divisions;
 - .2 Specifications take precedence over drawings bound with specifications;
 - .3 Specifications take precedence over door schedules, whether they are bound with the specifications or integral with the drawings;
 - .4 Door schedules take precedence over drawings, whether they are bound with the specifications or integral with the drawings.
-
- .2 Plans (drawings) and Specifications are complementary. When work is shown or mentioned on the drawings but is not indicated in the Specifications, or when work is indicated in the Specifications but is not shown or mentioned on the Drawings, it shall nevertheless be included in the Contract.
 - .3 The sub-division of the Specification into sections, identified by title and number, is for convenience only and does not modify the singularity of the document, nor does it operate to make or imply that the Owner is an arbiter to establish the limits or extent of contract between Contractor and Subcontractors or to determine the limits or extents of work that may be decided by trade unions or contractors' organizations. Extras to the Contract will not be considered on the grounds of differences in interpretation of the Specification and/or Plans (drawings) as to which trade performs the work.

1.8 SUBCONTRACTORS

- .1 Within 48 hours of tender acceptance submit a list of subcontractors

1.9 SUPPLEMENTARY INFORMATION FOR PROGRESS PAYMENTS

- .1 Submit to Owner, within 5 working days of Contract Award, cost breakdown with funding accountabilities, in detail as directed, and on form provided, by Consultant, for parts of Work, aggregating total amount of Contract Price, so as to facilitate evaluation of applications for payment. After approval by Owner, cost breakdown will be used as basis for progress payments.

1.10 CONTRACTOR USE OF PREMISES

- .1 Contractor shall limit use of premises for Work, for storage, and for access, to allow;
 - .1 Occupancy.
 - .2 Partial occupancy.
 - .3 Occupancy of other facilities on site.

- .4 Public usage.
- .2 Parking and bin placement will be the responsibility of the Contractor.
- .3 Coordinate use of premises under direction of Consultant and Owner.
- .4 Obtain and pay for use of additional storage or work areas needed for operations under this Contract.
- .5 Do not unreasonably encumber the site with materials and equipment.
- .6 Assume full responsibility for protection and safekeeping of products under this Contract.
- .7 Move stored products or equipment which interfere with operations of Tenants.
- .8 Remove or alter existing work to prevent injury or damage to portions of existing work which remain.
- .9 Repair or replace portions of existing work which have been altered during construction operations to match existing or adjoining work, as directed by Consultant.
- .10 At completion of operations condition of existing work: equal to or better than that which existed before new work started.

1.11 OCCUPANCY

- .1 Premises will be occupied during entire construction period for execution of normal operations. (Area under renovation will be off limits to occupants)
- .2 Must provide 48 hours notice if after hours' work is required. Cooperate with Consultant and Owner in scheduling operations to minimize conflict and to facilitate Owner/Tenants usage.
- .3 The existing building must remain legally accessible and kept operational at all times.
- .4 Owner shall have access to all parts of the site to do minor maintenance and repairs to the existing building within the area of construction. The Consultant (who is the key contact) will co-ordinate the scheduling of Tenant's work with the Contractor.

1.12 EXISTING CONDITIONS

- .1 The Contract Drawings attempt to depict the anticipated "as found" conditions insofar as such can be determined from limited information gathered during the preparation of the various documentation. The Contractor shall anticipate variations from the drawn

details and make such additional cost allowances as he may deem necessary for Contract completion without extras.

- .2 The Contractor and all sub-trades are responsible to investigate and familiarize themselves with all existing conditions that may affect the performance of their work, and are required to report promptly to Consultant any and all conditions that may compromise the performance of the Work.
- .3 The complete set of contract documents, both drawings and specifications, shall be read and examined by all trades to acquaint them with the full nature of the required work. Failure to do so will not relieve them of the responsibility for completing the work, nor for co-ordination of the work, prevention of delay or supply of labour, materials and equipment necessary for the proper execution of the Contract at no additional cost to the Contract. What is identified by one discipline within the contract documents as being part of contract, and not identified by another, shall not absolve the contractor of the supply and / or installation of said item, with written confirmation by owner / consultant, as such item shall be considered part of the contract no matter which discipline references and /or identifies said item.
- .4 The responsibility as to which Subcontractor or sub-trade provides required articles and materials to be built in or provided rests solely with the Contractor. Extras will not be considered based on grounds of difference in interpretation of the Contract Documents as to which Subcontractor or sub-trade involved will provide certain specialties, materials, or services, in order that the end product conform to the intent of the Contract.
- .5 All existing conditions of the base building are considered diagrammatic and must be verified on site as applicable to this project. All existing dimensions are approximate and must be verified on site as applicable to this project only. The drawings attempt to depict all the anticipated "as found" conditions insofar as such have been determined from details on available drawings and information gathered from the site during preparation of various contract documentation. However, contractor shall anticipate variations from the drawn details and shall make such additional cost allowances as the may deem necessary for contract completion without 'extras'. No 'extras' will be

1.13 PROTECTION OF EXISTING EXTERIOR FINISHES:

- .1 Existing building with original exterior finishes and fixtures, applicable to items constructed and / or installed at date of buildings construction are considered heritage elements and must be left in place, and protected with the highest level of care at all times during all demolition and new construction.

1.14 PROTECTION OF EXISTING INTERIOR FINISHES:

- .2 Existing building with original interior finishes and fixtures, applicable to items constructed and / or installed at date of buildings construction are considered heritage elements and must be left in place, and protected at all times with the highest level of care during all demolition and new construction.
 - .1 These items include:
 - .1 Original terrazzo floors: within the elevator lobbies and service corridors, including freight elevator lobbies.
 - .2 Original Marble walls panels within the elevator lobbies, and extensions from elevator lobbies into service corridors.
 - .3 Original painted metal convection unit covers and panels
 - .4 Original plaster cornice moldings, located along all ceiling beams.
 - .5 Original wood baseboards, found along a majority of exterior perimeter walls, select columns, and existing service cores (interior and exterior of washrooms), and service corridors.
 - .6 Base building core doors, including but not limited to: washrooms, housekeeping rooms, and various utility closets.
- .2 General Contractor will be required to ensure adequate protection is provided to all original building elements that are to remain in place, during all phases of construction, applicable to 7th floor.
- .3 General Contractor will be required to document all original existing features and fixtures prior to construction, to ensure an accurate record is maintained of existing elements that are found in good condition, and damaged.

1.15 PHOTOGRAPHIC DOCUMENTATION

- .3 Provide monthly photographic progress reports with photos and captions showing all areas under construction within each period.
- .2 Before start of construction provide photographs of each affected area. Submit with progress reports.

1.16 DOCUMENTS REQUIRED

- .1 Maintain at job site, one copy each document as follows:
 - .1 Contract Drawings.

- .2 Specifications.
- .3 Addenda.
- .4 Reviewed Shop Drawings.
- .5 List of Outstanding Shop Drawings.
- .6 Change Orders.
- .7 Other Modifications to Contract.
- .8 Field Test Reports.
- .9 Copy of Approved Work Schedule.
- .10 Health and Safety Plan and Other Safety Related Documents.
- .11 Other documents as specified.
- .12 Other documents requested by Consultant.

END OF SECTION

Part 1 General

1.1 ACCESS AND EGRESS

- .1 Design, construct and maintain temporary "access to" and "egress from" work areas, including stairs, runways, ramps or ladders and scaffolding, independent of finished surfaces and in accordance with relevant municipal, provincial and other regulations.

1.2 WORK RESTRICTIONS

- .1 Shut-down of the main building systems to be performed during normal working hours (08:00AM to 16:30PM Monday to Friday).
- .2 Renovations in most occupied areas to be performed during normal working hours, 08:00AM to 16:30PM Monday to Friday. Coordinate actual time required for any work with Owners Representative before proceeding with Work. Work not permitted outside of working hours unless approved.
- .3 All work in mechanical rooms and exterior construction is to occur during regular business hours, 08:00AM to 17:00PM Monday to Friday.
- .4 Co-ordinate activities to prevent dust / fumes from entering fresh air intakes and maintain extra filtration.
- .5 Coordinate actual time required for any partial and/or complete shut-down with Building Management and project manager before proceeding with Work.
- .6 For evening and weekend work, prior approval is required. Schedule for duration, and personnel involved in work required.
- .7 Phased demolition and construction work to be approved and coordinated with building management and project manager, to ensure building security is maintained at all times.

1.3 USE OF SITE AND FACILITIES

- .1 Execute work with least possible interference or disturbance to normal use of premises. Make arrangements with Owners Representative to facilitate work as stated.
- .2 Maintain existing services to building and provide for personnel and vehicle access.
- .3 Where security may be compromised by work in contract, the Owners Representative must be contacted immediately for coordination and authorization of any temporary means to maintain security.
- .4 Closures: protect work temporarily until permanent enclosures are completed.

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- .5 **Work Permits:**
- .1 Submit to the Building Manager, on a weekly basis, a proposed schedule of the work including the number of workers, materials and equipment anticipated on the site.
- .2 The Building Manager shall issue weekly work permits.
- .3 Submit proposed work schedule not less than one week before anticipated commencement of the work.

1.4 COMMUNICATIONS

- .1 Not used.

1.5 BUILDING SMOKING ENVIRONMENT

- .1 No smoking is permitted in the building.
- .2 Smoke outside only in designated areas.

Part 2 Products

2.1 NOT USED

- .1 Not used.

Part 3 Execution

3.1 NOT USED

- .1 Not used.

END OF SECTION

Part 1 General

1.1 ADMINISTRATIVE

- .1 Schedule and administer project meetings throughout the progress of the work at the call of Consultant.
- .2 Prepare agenda for meetings.
- .3 Distribute written notice of each meeting four days in advance of meeting date to Consultants and Owner.
- .4 Meeting will be held in an alternative location. Consultant will confirm upon award.
- .5 Preside at meetings.
- .6 Record the meeting minutes. Include significant proceedings and decisions. Identify actions by parties.
- .7 Reproduce and distribute copies of minutes within three days after meetings and transmit to meeting participants and, affected parties not in attendance.
- .8 Representative of Contractor, Subcontractor and suppliers attending meetings will be qualified and authorized to act on behalf of party each represents.

1.2 PRECONSTRUCTION MEETING

- .1 Within 10 days after award of Contract, request a meeting of parties in contract to discuss and resolve administrative procedures and responsibilities.
- .2 Owner, Contractor, Consultant, Sub-consultants, major Subcontractors, field inspectors and supervisors will be in attendance.
- .3 Establish time and location of meeting and notify parties concerned minimum 5 days before meeting.
- .4 Incorporate mutually agreed variations to Contract Documents into Agreement, prior to signing.
- .5 Agenda to include:
 - .1 Appointment of official representative of participants in the Work.
 - .2 Schedule of Work: in accordance with Section 01 32 16.06 - Construction Progress Schedule - Critical Path Method (CPM).
 - .3 Schedule of submission of shop drawings, samples, colour chips. Submit submittals in accordance with Section 01 33 00 - Submittal Procedures.
 - .4 Requirements for temporary facilities, site sign, offices, storage sheds, utilities, fences in accordance with Section 01 52 00 - Construction Facilities.
 - .5 Delivery schedule of specified equipment.
 - .6 Site security in accordance with Section 01 56 00 - Temporary Barriers and Enclosures.
 - .7 Proposed changes, change orders, procedures, approvals required, mark-up

percentages permitted, time extensions, overtime, administrative requirements.

- .8 Owner provided products.
- .9 Record drawings in accordance with Section 01 33 00 - Submittal Procedures.
- .10 Maintenance manuals in accordance with Section 01 78 00 - Closeout Submittals.
- .11 Take-over procedures, acceptance, warranties in accordance with Section 01 78 00 - Closeout Submittals.
- .12 Monthly progress claims, administrative procedures, photographs, hold backs.
- .13 Appointment of inspection and testing agencies or firms.
- .14 Insurances, transcript of policies.
- .15 Waste reduction management.

1.3 PROGRESS MEETINGS

- .1 During course of Work and two weeks prior to project completion, schedule progress meetings bi-weekly.
- .2 Contractor, major Subcontractors, and Consultant involved in work are to be in attendance.
- .3 Notify parties minimum 5 days prior to meetings.
- .4 Record minutes of meetings and circulate to attending parties and affected parties not in attendance within 4 days after meeting.
- .5 Agenda to include the following:
 - .1 Review, approval of minutes of previous meeting.
 - .2 Review of Work progress since previous meeting.
 - .3 Field observations, problems, conflicts.
 - .4 Problems which impede construction schedule.
 - .5 Review of off-site fabrication delivery schedules.
 - .6 Corrective measures and procedures to regain projected schedule.
 - .7 Revision to construction schedule.
 - .8 Progress schedule, during succeeding work period.
 - .9 Review submittal schedules: expedite as required.
 - .10 Maintenance of quality standards.
 - .11 Review proposed changes for effect on construction schedule and on completion date.
 - .12 Other business.

END OF SECTION

Part 1 General

1.1 REFERENCES

- .1 Definitions:
 - .1 Activity: element of Work performed during course of Project. Activity normally has expected duration, and expected cost and expected resource requirements. Activities can be subdivided into tasks.
 - .2 Bar Chart (Gantt chart): graphic display of schedule-related information. In typical bar chart, activities or other Project elements are listed down left side of chart, dates are shown across top, and activity durations are shown as date-placed horizontal bars.
 - .3 Baseline: original approved plan (for Project, work package, or activity), plus or minus approved scope changes.
 - .4 Cash Flow: projection of progress payment requests based on cash loaded construction schedule.
 - .5 Completion Milestones: they are firstly [Interim Certificate] [Substantial Completion] and secondly Final Certificate.
 - .6 Constraint: applicable restriction or limitation, either internal or external to project, that will affect performance of Project. Factors that affect activities can be scheduled.
 - .7 Control: process of comparing actual performance with planned performance, analyzing variances, evaluating possible alternatives, and taking appropriate corrective action as needed.
 - .8 Critical Activity: any activity on a critical path.
 - .1 Most commonly determined by using critical path method.
 - .9 Critical Path: sequence of activities that determines duration of Project. Generally, it is the longest path through Project.
 - .1 Usually defined as those activities with float less than or equal to specified value, often zero.
 - .10 Critical Path Method (CPM): network analysis technique used to determine the amount of scheduling flexibility (amount of float) on various logical network paths in Project schedule network, and to determine the minimum total Project duration.
 - .11 Data Date: date through which project status and progress were last determined and reported for analyses, such as scheduling and performance measurements.
 - .12 Duration: total number of work periods (not including holidays or other non-working periods) required to complete activity or other Project element.

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- .1 Usually expressed as workdays or work weeks.
 - .13 Early Finish Date: in critical path method, earliest possible point in time on which uncompleted portions of activity (or Project) can finish, based on network logic and schedule constraints.
 - .1 Early finish dates can change as Project progresses and changes are made to Project plan.
 - .14 Early Start Date: in critical path method, earliest possible point in time on which uncompleted portions of activity (or Project) can start, based on network logic and schedule constraints.
 - .1 Early start dates can change as Project progresses and changes are made to Project Plan.
 - .15 Finish Date: point in time associated with activity's completion.
 - .1 Usually qualified by one of following: actual, planned, estimated, scheduled, early, late, baseline, target, or current.
 - .16 Float: amount of time that activity may be delayed from its early start without delaying Project finish date.
 - .1 This resource is available to both VAC and Contractor.
 - .17 Impact Analysis: schedule analysis technique that adds a modeled delay to an accepted construction schedule to determined possible outcome of that delay on project completion.
 - .18 Lag: modification of logical relationship that directs delay in successor activity.
 - .19 Late Finish Date (LF): in critical path method, latest possible point in time that activity may be completed without delaying specified milestone (usually Project finish date).
 - .20 Late Start Date (LS): in critical path method, latest possible point in time that activity may begin without delaying specified milestone (usually Project finish date).
 - .21 Lead: modification of logical relationship that allows acceleration of successor task.
 - .22 Logic Diagram: see Project network diagram.
 - .23 Master Schedule: summary-level schedule that identifies major deliverable; work breakdowns structure and key milestones.
 - .24 Milestone: significant point or event in Project, usually completion of major deliverable.
 - .25 Monitoring: capture, analysis, and reporting of Project performance, usually as compared to plan.

- .26 Non-Critical Activities: activities which when delayed, do not affect specified Contract duration.
- .27 Project Control System: fully computerized system utilizing commercially available software packages.
- .28 Project Network Diagram: schematic display of logical relationships of Project activities.
 - .1 Always drawn from left to right to reflect Project chronology.
- .29 Project Plan: formal, approved document used to guide both Project execution and Project control.
 - .1 Primary uses of Project plan are to document planning assumptions and decisions, facilitate communication among stakeholders, and document approved scope, cost, and schedule baselines.
 - .2 Project plan may be summary or detailed.
- .30 Project Planning: development and maintenance of Project Plan.
- .31 Project Planning, Monitoring and Control System: overall system operated to enable monitoring of Project Work in relation to established milestones.
- .32 Project Schedule: planned dates for performing activities and planned dates for meeting milestones.
- .33 Quantified days duration: working days based on 5-day work week, discounting statutory holidays.
- .34 Risk: uncertain event or condition that, if it occurs, has positive or negative effect on Project's objectives.
- .35 Start Date: point in time associated with activity's start, usually qualified by one of following: actual, planned, estimated, scheduled, early, late, target, baseline, or current.
- .36 Work Breakdown Structure (WBS): deliverable-oriented hierarchical decomposition of Work to be executed by contractor to accomplish project objectives and create required deliverables. It organizes and defines total scope of Project. Each descending level represents an increasingly detailed definition of Project Work. WBS is decomposed into Work packages.
- .2 Reference Standards:
 - .1 Project Management Institute (PMI Standards)
 - .1 A Guide to the Project Management Body of Knowledge (PMBOK Guide) - [Fourth Edition].
 - .2 Practice Standard for Scheduling - [2011].

1.2 ADMINISTRATIVE REQUIREMENTS

-
- .1 Project Meeting:
 - .1 Meet with Consultant within 10 days working days of Award of Contract date, to establish Work requirements and approach to project construction operations.
 - .2 Participate in regular project progress meetings with Consultant specifically intended to discuss update of detailed schedule and contract changes.
 - .2 Scheduling:
 - .1 Planning: ensure that planning process is iterative and results in generally top-down processing with more detail being developed as planning progresses, and decisions concerning options and alternatives are made.
 - .2 Ensure project schedule efficiencies through monitoring of Project in detail to ensure integrity of Critical Path, by comparing actual completions of individual activities with their scheduled completions, and review progress of activities that has started but are not yet completed.
 - .3 Monitor sufficiently often so that causes of delays can immediately be identified and removed.
 - .3 Project monitoring and reporting:
 - .1 Keep team aware of changes to schedule, and possible consequences as project progresses.
 - .2 Use narrative reports to provide advice on seriousness of difficulties and measures to overcome them.
 - .3 Begin narrative reporting with statement on general status of Project followed by summarization of delays, potential problems, corrective measures and Project status criticality.
 - .4 Critical Path Method (CPM) Requirements:
 - .1 Ensure Master Plan and Detail Schedule are practical and remain within specified Contract duration.
 - .2 Revise Master Schedule and Detail Schedule deemed impractical by Consultant and resubmit for approval.
 - .3 Change to Contract Duration:
 - .1 Acceptance of Master Schedule and Detail Schedule showing scheduled Contract duration shorter than specified Contract duration does not constitute change to Contract.
 - .2 Duration of Contract may only be changed through bilateral Agreement.
 - .4 Consider Master Schedule and Detail Schedule deemed practical by Consultant, showing Work completed in less than specified Contract duration, to have

float.

- .5 First Milestone on Master Schedule and Detail Schedule will identify start Milestone with an "ES" constraint date equal to Award of Contract date.
- .6 Calculate dates for completion milestones from Plan and Schedule using specified time periods for Contract.
- .7 Interim Certificate with "LF" constraint equal to calculated date.
- .8 Calculations on updates to be such that if early finish of Interim Certificate falls later than specified Contract duration then float calculation to reflect negative float.
- .9 Delays to non-critical activities, those with float may not be basis for time extension.
- .10 Do not use float suppression techniques such as software constraints.
- .11 Allow for and show Master Plan and Detail Schedule adverse weather conditions normally anticipated.
 - .1 Specified Contract duration has been predicated assuming normal amount of adverse weather conditions.
- .12 Provide necessary crews and manpower to meet schedule requirements for performing Work within specified Contract duration.
 - .1 Simultaneous use of multiple crews on multiple fronts on multiple critical paths may be required.
- .13 Arrange participation on and off site of subcontractors and suppliers, as required by Consultant, for purpose of network planning, scheduling, updating and progress monitoring.
 - .1 Approvals by Consultant of original networks and revisions do not relieve Contractor from duties and responsibilities required by Contract.
- .14 Ensure that it is understood that Award of Contract or time of beginning, rate of progress, Interim Certificate and Final Certificate as defined times of completion are of essence of this contract.

1.3 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Submit in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Submit to Consultant Project Control System for planning, scheduling, monitoring and reporting of project progress.
- .3 Submit Project Control System to Consultant for approval.
 - .1 Failure to comply with each required submission, may result in progress payment being withheld in accordance with Federal Government's GC 5 Terms

of Payment.

- .4 Include costs for execution, preparation and reproduction of schedule submittals in bid documents.
- .5 Submit letter ensuring that schedule has been prepared in co-ordination with major sub- contractors.
- .6 Refer to article "PROGRESS MONITORING AND REPORTING" of this specification Section for frequency of Project control system submittals.
- .7 Submit impact analysis of schedule for changes that result in extension of contract duration.
 - .1 Include draft schedule update and report as outlined in article "PROGRESS MONITORING AND REPORTING".
- .8 Within 10 working days of Award of Contract, submit Project planning, monitoring and control system data as required by Consultant in following form.
 - .1 Master Schedule Bar (GANTT) Chart.

1.4 QUALITY ASSURANCE

- .1 Use experienced personnel, fully qualified in planning and scheduling to provide services from start of construction to Final Certificate, including Commissioning.

1.5 WORK BREAKDOWN STRUCTURE (WBS)

- .1 Prepare construction Work Breakdown Structure (WBS) within 15 working days of Award of Contract date.
 - .1 Develop WBS through at least five levels: project, stage, element, sub-element and work package.

1.6 DETAIL SCHEDULE

- .1 Provide detailed project schedule (CPM logic diagram) within 10 working days of Award of Contract date showing activity sequencing, interdependencies and duration estimates. Include listed activities as follows:
 - .1 Award of Contract.
 - .2 Shop drawings.
 - .3 Samples.
 - .4 Permits.
 - .5 Mobilization.
 - .6 Approvals.
 - .7 Procurement.
 - .8 Doors & Windows.

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- .9 Construction.
 - .10 Lighting
 - .11 Electrical
 - .12 Controls
 - .13 Heating, Ventilating, and Air Conditioning
 - .14 Millwork
 - .15 Fire Systems
 - .16 Installation.
 - .17 Site works.
 - .18 Testing and Inspections.
 - .19 Supplied equipment long delivery items
 - .20 Commissioning and acceptance.
 - .21 Substantial Performance
 - .22 Final Completion
 - .23 Warranty Inspection
 - .2 Detail CPM schedule to cover in detail minimum period of 12 months beginning from Award of Contract date with each activity duration approximately 5 days.
 - .1 Show remaining activities for CPM construction network system up to Final Certificate and develop complete detail as project progresses.
 - .2 Detail activities completely and comprehensively throughout duration of project.
 - .3 Relate Detail Schedule activities to basic activities and milestones developed and approved in Master Schedule.
 - .4 Clearly show sequence and interdependence of construction activities and indicate:
 - .1 Start and completion of all items of Work, their major components, and interim milestone completion dates.
 - .2 Activities for procurement, delivery, installation and completion of each major piece of equipment, materials and other supplies, including:
 - .1 Time for submittals, resubmittals and review.
 - .2 Time for fabrication and delivery of manufactured products for Work.
 - .3 Interdependence of procurement and construction activities.
 - .3 Include sufficient detail to assure adequate planning and execution of Work. Activities should generally range in duration from 3 to 15 workdays each.

- .5 Provide level of detail for project activities such that sequence and interdependency of Contract tasks are demonstrated and allow co-ordination and control of project activities. Show continuous flow from left to right.
- .6 Ensure activities with no float are calculated and clearly indicated on logical CPM construction network system as being, whenever possible, continuous series of activities throughout length of Project to form "Critical Path". Increased number of critical activities is seen as indication of increased risk.
- .7 Insert Change Orders in appropriate and logical location of Detail Schedule. After analysis, clearly state and report to Consultant for review effects created by insertion of new Change Order.

1.7 REVIEW OF THE CONSTRUCTION DETAIL SCHEDULE

- .1 Allow 5 work days for review by Consultant.
- .2 Upon receipt of reviewed Detail Schedule make necessary revisions and resubmit to Consultant for review within 5 work days.
- .3 Promptly provide additional information to validate practicability of Detail Schedule as required by Consultant.
- .4 Submittal of Detail Schedule indicates that it meets Contract requirements and will be executed generally in sequence.

1.8 COMPLIANCE WITH DETAIL SCHEDULE

- .1 Comply with reviewed Detail Schedule.
- .2 Proceed with significant changes and deviations from scheduled sequence of activities that cause delay, only after written receipt of approval by Consultant.
- .3 Identify activities that are behind schedule and causing delay. Provide measures to regain slippage.
 - .1 Corrective measures may include:
 - .1 Increase of personnel on site for effected activities or work package.
 - .2 Increase in materials.
 - .3 Overtime work.
- .4 Submit to Consultant, justification, project schedule data and supporting evidence for approval of extension to Contract completion date or interim milestone date when required. Include as part of supporting evidence:
 - .1 Written submission of proof of delay based on revised activity logic, duration and costs, showing time impact analysis illustrating influence of each change or delay relative to approved contract schedule.
 - .2 Prepared schedule indicating how change will be incorporated into the overall logic diagram. Demonstrate perceived impact based on date of occurrence of

- change and include status of construction at that time.
- .3 Other supporting evidence requested by Consultant.
- .4 Do not assume approval of Contract extension prior to receipt of written approval from Consultant.
- .5 In event of Contract extension, display in Detail Schedule that scheduled float time available for work involved has been used in full without jeopardizing earned float.
 - .1 Consultant will determine and advise Contractor number of allowable days for extension of Contract based on project schedule updates for period in question, and other factual information.
 - .2 Construction delays affecting project schedule will not constitute justification for extension of contract completion date.

1.9 PROGRESS MONITORING AND REPORTING

- .1 On ongoing basis, Detail Schedule on job site must show "Progress to Date". Arrange participation on and off site of subcontractors and suppliers, as, and when necessary, for purpose of network planning, scheduling, updating and progress monitoring. Inspect Work with Consultant at least once monthly to establish progress on each current activity shown on applicable networks.
- .2 Update and reissue project Work Breakdown Structure and relevant coding structures as project develops and changes.
- .3 Perform Detail Schedule update monthly with status dated (Data Date) on last working day of month. Update to reflect activities completed to date, activities in progress, logic and duration changes.
- .4 Do not automatically update actual start and finish dates by using default mechanisms found in project management software.
- .5 Submit to Consultant copies of updated Detail Schedule.
- .6 Requirements for monthly progress monitoring and reporting are basis for progress payment request.
- .7 Submit monthly written report based on Detail Schedule, showing Work to date performed, comparing Work progress to planned, and presenting current forecasts. Report must summarize progress, defining problem areas and anticipated delays with respect to Work schedule, and critical paths. Explain alternatives for possible schedule recovery to mitigate any potential delay. Include in report:
 - .1 Description of progress made.
 - .2 Pending items and status of: permits, shop drawings, change orders, possible time extensions.
 - .3 Status of Contract completion date and milestones.
 - .4 Current and anticipated problem areas, potential delays and corrective

measures.

.5 Review of progress and status of Critical Path activities.

1.10 PROJECT MEETINGS

- .1 Discuss Project Schedule at regular site meetings, identify activities that are behind schedule and provide measures to regain slippage. Activities considered behind schedule are those with projected start or completion dates later than current approved dates shown on baseline schedule.
- .2 Weather related delays with their remedial measures will be discussed and negotiated.

END OF SECTION

Part 1 General

1.1 ADMINISTRATIVE

- .1 Submit to Consultant submittals listed 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 and no claim for extension by reason of such default will be allowed.
- .2 Work affected by submittal shall not proceed until review is complete (due to phased project schedule – quick reviews and approvals are necessary).
- .3 Present shop drawings, product data, samples in SI Metric units.
- .4 Where items or information is not produced in SI Metric units converted values are acceptable.
- .5 Review submittals prior to submission to Consultant. This review represents that necessary requirements have been determined and verified, or will be, and that each submittal has been checked and coordinated with requirements of Work and Contract Documents. Submittals not stamped, signed, dated and identified as to specific project will be returned without being examined and shall be considered rejected.
- .6 Notify Consultant, in writing at time of submission, identifying deviations from requirements of Contract Documents stating reasons for deviations.
- .7 Verify field measurements and affected adjacent Work to be coordinated.
- .8 Manufacturer's "standard ("off-the-shelf) drawings" will only be accepted as shop drawings for review providing that all the additional information specified herein and shown on the drawings is included. Should the shop drawings submitted for review not include all the information asked for, they will be stamped "re-submit" and returned to the Contractor for re-submission. The Consultant will not be responsible for delays due to improperly prepared or submitted shop drawings.
- .9 Contractor's responsibility for errors and omissions in submission is not relieved by Consultant's review of submittals.
- .10 Contractor's responsibility for deviations in submission from requirements of Contract Documents is not relieved by Consultant's review.
- .11 Keep one reviewed copy of each submission on site.

1.2 SHOP DRAWINGS & PRODUCT DATA

- .1 The term "shop drawings" means drawings, diagrams, illustrations, schedules, performance charts, brochures and other data which are to be provided by Contractor to illustrate details of a portion of Work.
- .2 Indicate materials, methods of construction and attachment or anchorage, erection diagrams, connections, explanatory notes and other information necessary for completion of Work. Where articles or equipment attach or connect to other articles or equipment, indicate that such items have been coordinated, regardless of Section under which adjacent items will be supplied and installed. Indicate cross references to design drawings and specifications.

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- .3 Allow ten (10) working days for Consultant's review of each submission.
 - .4 Adjustments made on shop drawings by Consultant are not intended to change Contract Price. If adjustments affect value of Work, state such in writing to Consultant and await contract amendment prior to proceeding with Work.
 - .5 Make changes in shop drawings as Consultant may require, consistent with Contract Documents. When resubmitting, notify Consultant in writing of any revisions other than those requested.
 - .6 Accompany submissions with transmittal letter, in duplicate, containing:
 - .1 Date.
 - .2 Project title and number.
 - .3 Contractor's name and address.
 - .4 Identification and quantity of each shop drawing, product data and sample.
 - .5 Other pertinent data.
 - .7 Submissions shall include:
 - .1 Date and revision dates.
 - .2 Project title and number.
 - .3 Name and address of:
 - .1 Subcontractor.
 - .2 Supplier.
 - .3 Manufacturer.
 - .4 Contractor's stamp, signed by Contractor's authorized representative certifying approval of submissions, verification of field measurements and compliance with Contract Documents.
 - .5 Details of appropriate portions of Work as applicable:
 - .1 Fabrication.
 - .2 Layout, showing dimensions, including identified field dimensions, and clearances.
 - .3 Setting or erection details.
 - .4 Capacities.
 - .5 Performance characteristics.
 - .6 Standards.
 - .7 Operating weight.
 - .8 Wiring diagrams.
 - .9 Single line and schematic diagrams.
 - .10 Relationship to adjacent work.

- .11 Equipment identification.
- .8 After Consultant review, distribute copies.
- .9 Submit 1 electronic copy in pdf format of shop drawings for each requirement requested in specification Sections and as Consultant may reasonably request.
- .10 Submit 1 electronic copy in pdf format of product data sheets or brochures for requirements requested in specification Sections and as requested by Consultant where shop drawings will not be prepared due to standardized manufacture of product. Include applicable web site addresses for manufacturers for future reference.
- .11 Delete information not applicable to project.
- .12 Supplement standard information to provide details applicable to project.
- .13 If upon review by Consultant, no errors or omissions are discovered or if only minor corrections are made, copies will be returned and fabrication and installation of Work may proceed. If shop drawings are rejected, noted copy will be returned and resubmission of corrected shop drawings, through same procedure indicated above, must be performed before fabrication and installation of Work may proceed.
- .14 The review of shop drawings by the Consultant is for sole purpose of ascertaining conformance with general concept. This review shall not mean that the Consultant approves detail design inherent in shop drawings, responsibility for which shall remain with Contractor submitting same, and such review shall not relieve Contractor of responsibility for errors or omissions in shop drawings or of responsibility for meeting all requirements of construction and Contract Documents. Without restricting generality of foregoing, Contractor is responsible for dimensions to be confirmed and correlated at job site, for information that pertains solely to fabrication processes or to techniques of construction and installation and for co-ordination of Work of all sub-trades.

1.3 SAMPLES

- .1 Submit for review samples as requested in respective specification Sections. Label samples with origin and intended use.
- .2 Deliver samples prepaid to Consultant's business address.
- .3 Notify Consultant in writing, at time of submission of deviations in samples from requirements of Contract Documents.
- .4 Where colour, pattern, or texture is criterion, submit full range of samples.
- .5 Adjustments made on samples by Consultant are not intended to change Contract Price. If adjustments affect value of Work, state such in writing to Consultant and await contract amendment prior to proceeding with Work.
- .6 Make changes in samples which Consultant may require, consistent with Contract Documents.
- .7 Reviewed and accepted samples will become standard of workmanship and material against which installed Work will be verified.

Part 2 Products

2.1 CONTRACTORS OPTIONS FOR SELECTION OF MATERIALS FOR BIDDING

- .1 Materials specified by referenced standard, select any material that meets or exceeds the specified standard.
- .2 Materials specified by "Prescriptive" or "Performance" specification, select any material meeting or exceeding specification.
- .3 Materials specified by naming one or more materials, select any material named. For the purpose of these specifications, the term "Acceptable Material" is deemed to be a complete and working commodity as described by a manufacturer's name, catalogue number, trade name or any combination thereof.
- .4 When materials are specified by a Standard, Prescriptive or Performance specifications, upon request of the Consultant, obtain from manufacturer an independent testing laboratory reporting, showing that the material or equipment meets or exceeds the specified requirements.
- .5 The design and drawings are based upon the acceptable materials, or products. The acceptable materials or products may not be identical in all aspects. A later claim by the Contractor for an addition to the contract price because of changes in work necessitated by use of acceptable materials, or products shall not be considered.

2.2 ALTERNATIVE MATERIALS

- .1 Refer to Sections 01 23 10 – Alternatives and Section 00 21 13 Instructions to Bidders regarding requests for Alternate Materials.

END OF SECTION

Part 1 General

1.1 REFERENCES

- .1 Canadian Labour Code, Latest Edition
- .2 Manitoba Occupational Health and Safety, Latest Edition
- .3 Manitoba Workers Compensation Act, Latest Edition

1.2 SUBMITTALS

- .1 Submit to the Consultant copies of the following documents, including updates issued:
 - .1 Health and Safety Program as indicated in paragraph below, prior to commencement of work on the work site.
 - .2 Reports or directions issued by authorities having jurisdiction, immediately upon issuance from that authority.
 - .3 Accident or Incident Reports, within 24 hrs of occurrence.
 - .4 Work Permits and Job Hazard Assessments, required to be submitted weekly by the General Contractor.
- .2 Submit other data, information and documentation upon request by Consultant as stipulated elsewhere in this section.

1.3 COMPLIANCE REQUIREMENTS

- .1 Comply with the latest edition of the Manitoba Occupational Health and Safety Act, and the Regulations made pursuant to the Act.
- .2 Observe the latest WHMIS program (2015), as well as continue to use WHMIS 1988 as both are required during the four (4) year transition time between the two programs.
- .3 Observe and enforce construction safety measures required by:
 - .1 National Building Code of Canada (latest edition).
 - .2 Provincial Worker's Compensation Board.
 - .3 Municipal statutes and ordinances.
 - .4 The General Safety Guide for Contractors and Service Providers of Riverview Health Centre. All Workers will be required to review this information.

- .4 In event of conflict between any provisions of above authorities the most stringent provision shall apply.
- .5 Provide and maintain Worker's Compensation Board coverage for all employees for the duration of the contract. Prior to commencement of the work, at the time of Interim Completion and prior to final payment, provide to the Consultant a letter of Clearance from the Workers' Compensation Board indicating that the Contractor's account is in good standing.
 - .1 Should the Contractor be a sole proprietor, provide documented proof in a form acceptable to Consultant, of an alternative means of personal coverage that meets or exceeds the requirements set out above for Worker's Compensation Board coverage.

1.4 RESPONSIBILITY

- .1 The Contractor is responsible for safety of persons and property on the work site and for protection of Owner's employees and the general public circulating adjacent to work site operations to extent that they may be affected by conduct of work.
- .2 The Contractor is to enforce compliance by workers and other persons granted access to work site with safety requirements of Contract Documents, applicable federal, provincial, and local statutes, regulations, and ordinances, and with the Contractor's Health and Safety Program.
- .3 Should an unforeseen or peculiar safety related hazard or condition become evident during performance of work, immediately take measures to rectify the situation and prevent damage or harm. Advise Consultant verbally and in writing of the hazard or condition.

1.5 SITE CONTROL AND ACCESS

- .1 Control all work site access points and work site activities. Delineate and isolate the work site from adjacent and surrounding areas by use of appropriate means to maintain control of all work site access points.
- .2 Make provisions for granting permission to access onto work site to all persons who require access. Procedures for granting permission to access are to be in accordance with the Manitoba Occupational Health and Safety Act, and the Regulations made pursuant to the Act and the Contractor's Health and Safety Program.
- .3 Ensure sub-trades or inspectors that are granted access to the work site, are in possession of and wear the minimum personal protective equipment (PPE) designated by the Contractor's Health and Safety Program. Ensure these persons granted access to the work site are provided with, trained in the use of, and wear, appropriate PPE that are required above and beyond the designated minimums previously noted and as specifically related to the work site activity that they are involved in. Be responsible for the efficacy of the PPE that is provided above and beyond the designated minimums.

- .4 Erect signage at access points and at other strategic locations around the work site clearly identifying the work site area(s) as being “off-limits” to non-authorized persons. Signage must be professionally made with well understood graphic symbols and is not to be used as advertising but for the specific use as related to site safety and key contact information.
 - .1 Additional Information to be provided on the signage is as follows:
Project Name/Description:
Contractor Company Name:
Project Superintendent’s Name/Phone No.:
Consultant Point of Contact Name/Phone No.:
 - .2 Secure the work site at all times to protect against un-authorized access.

1.6 FILING OF NOTICE

- .1 File Notice of Project and any other required Notices with the Provincial/Territorial Authorities prior to commencement of the work. Provide Consultant with a copy of the filed Notice(s) prior to commencement of the work.

1.7 PERMITS

- .1 General Contractor to obtain permits, licenses and compliance certificates at appropriate times and frequencies as required by the authorities having jurisdiction.
- .2 Post all permits, licenses and compliance certificates on work site and provide copies to the Consultant.

1.8 PROJECT/SITE CONDITIONS

- .1 The following are the known hazardous substances and/or hazardous conditions at the work site, which shall be considered as health or environmental hazards and shall be properly managed should they be encountered as part of the work:
 - .1 None known at time of bid submission.
- .2 The above list shall not be construed as being complete and inclusive of all safety and health hazards encountered as a result of the Contractor’s operations during the course of work. Include the above items into the hazard assessment program specified herein.
- .3 Upon request, provide a site/job specific safety plan that includes, when required, a job specific hazard assessment. The safety plans/hazard assessments are to be completed prior to work starting, and submitted for review. A hazard assessment can be requested at any point during the course of the work. Should the work conditions change a revised hazard assessment/safety plan is required.
 - .1 At the very minimum (but not limited to), the following will require a site specific hazard assessment:

- .1 Any work on electrical equipment over 600V
- .2 Any work above ground level using ladders, scaffold, man lifts, or any other elevating equipment over 3000mm.
- .3 Any work using a crane, or hoisting device
- .4 Any work where designated substances/hazardous materials are being handled.

1.9 CONFINED SPACE ENTRY POLICY

- .1 No employee shall enter or be permitted to enter any confined space unless such entry is made in compliance with the applicable Occupational Health and Safety Regulations.
- .2 The Contractor will make himself and employees and sub-contractors, aware of and abide by policy on confined space entry and the locations affected by said policy.
- .3 The Contractor will be required to submit a company confined space program should the work involve confined space entry.

1.10 MEETINGS

- .1 Prior to commencement of work, attend a pre-commencement meeting conducted by the Contractor. Ensure minimum attendance by contractor's site superintendent. Contractor will advise of time, date and location of the meeting and will be responsible for recording and distributing the minutes.
- .2 Conduct site specific occupational health and safety meetings as required by the Manitoba Occupational Health and Safety Act, and the Regulations made pursuant to the Act.
- .3 Record and post minutes of all meetings in plain view on the work site. Make copies available to the Consultant upon request.

1.11 HEALTH AND SAFETY PROGRAM

- .1 Provide one copy of the Health and Safety Program to the Consultant prior to commencement of work on the work site.
 - .1 The copy provided to the Consultant is for the purpose of review against the contract requirements related to the known hazardous substances and/or hazardous conditions. The review is not to be construed to imply approval by the Consultant that the program is complete, accurate and legislatively compliant with the Manitoba Occupational Health and Safety Act, and the Regulations made pursuant to the Act, and shall not relieve the Contractor of their legal obligations under such legislation.

- .2 Resubmit the Health and Safety Program upon any changes throughout the period of the contract, and at minimum, on an annual basis (every 12 months).

1.12 ACCIDENT REPORTING

- .1 Investigate and report incidents and accidents as required by Manitoba Occupational Safety and Health Act, and the Regulations made pursuant to the Act.
- .2 For the purpose of this contract immediately investigate and provide a report to the Consultant on incidents and accidents that involve:
 - .1 A resulting injury that may or may not require medical aid but involves lost time at work by the injured person(s).
 - .2 Exposure to toxic chemicals or substances.
 - .3 Property damage.
 - .4 Interruption to adjacent and/or integral infrastructure operations with potential loss implications.
- .3 In the investigation and reporting of incidents and accidents, the Contractor is required to respond in writing within a timely fashion (24 hours), indicating the actions taken to correct the act that was deemed to have caused the incident and/or accident and advise what steps will be taken prevent a re-occurrence of the incident and/or accident.

1.13 RECORDS ON SITE

- .1 Maintain on site a copy of the safety documentation as specified in this section and any other safety related reports and documents issued to or received from the authorities having jurisdiction.
- .2 Upon request, make copies available to the Consultant and Owner.

Part 2 Products

2.1 NOT USED

- .1 Not Used

Part 3 Execution

3.1 NOT USED

- .1 Not used

END OF SECTION

Part 1 General

1.1 REFERENCES AND CODES

- .1 Perform Work in accordance with the latest version of the National Building Code of Canada (NBC) including all amendments up to tender closing date and other codes of provincial or local application provided that in case of conflict or discrepancy, more stringent requirements apply.
- .2 Meet or exceed requirements of:
 - .1 Contract documents.
 - .2 Specified standards, codes and referenced documents.

1.2 PERMITS

- .1 General Contractor to obtain and pay for the building permit from the authority having jurisdiction.
- .2 General Contractor to obtain and pay for the Occupancy Permit(s) when the work or any part of the work is to be accepted for occupancy.
- .3 Be responsible for co-ordinating and conducting tests of the building systems as may be required by the authorities having jurisdiction as a requirement to obtain occupancy permit.

1.3 HAZARDOUS MATERIAL DISCOVERY

- .1 Asbestos: demolition of spray or trowel-applied asbestos is hazardous to health. Stop work immediately when material resembling spray or trowel-applied asbestos is encountered during demolition work. Notify Consultant.
- .2 PCB: Polychlorinated Biphenyl: stop work immediately when material resembling Polychlorinated Biphenyl is encountered during demolition work. Notify Consultant.
- .3 Mould: stop work immediately when material resembling mould is encountered during demolition work. Notify Consultant.

1.4 BUILDING SMOKING ENVIRONMENT

- .1 Comply with smoking restrictions and municipal by-laws.
- .2 Comply with Owner's policy regarding smoking restrictions on Owner's property.

END OF SECTION

Part 1 General

1.1 INSPECTION

- .1 Allow Consultant access to Work. If part of Work is in preparation at locations other than Place of Work, allow access to such Work whenever it is in progress.
- .2 Give timely notice requesting inspection if Work is designated for special tests, inspections or approvals by Consultant instructions, or law of Place of Work.
- .3 If Contractor covers or permits to be covered Work that has been designated for special tests, inspections or approvals before such is made, uncover such Work, have inspections or tests satisfactorily completed and make good such Work.
- .4 Consultant will order part of Work to be examined if Work is suspected to be not in accordance with Contract Documents. If, upon examination such work is found not in accordance with Contract Documents, correct such Work and pay cost of examination and correction.

1.2 ACCESS TO WORK

- .1 Allow inspection/testing agencies access to Work, off site manufacturing and fabrication plants.
- .2 Co-operate to provide reasonable facilities for such access.

1.3 PROCEDURES

- .1 Notify appropriate agency and Consultant in advance of requirement for tests, in order that attendance arrangements can be made.
- .2 Submit samples and/or materials required for testing, as specifically requested in specifications. Submit with reasonable promptness and in orderly sequence to not cause delays in Work.
- .3 Provide labour and facilities to obtain and handle samples and materials on site. Provide sufficient space to store and cure test samples.

1.4 REJECTED WORK

- .1 Remove defective Work, whether result of poor workmanship, use of defective products or damage and whether incorporated in Work or not, which has been rejected by Consultant as failing to conform to Contract Documents. Replace or re-execute in accordance with Contract Documents.
- .2 Make good other Contractor's work damaged by such removals or replacements promptly.
- .3 If in the opinion of Consultant, it is not expedient to correct defective Work or Work not performed in accordance with Contract Documents, Consultant will deduct from Contract Price difference in value between Work performed and that called for by Contract Documents, amount of which will be determined by the Consultant.

1.5 REPORTS

- .1 Submit 4 copies of inspection and test reports to Department Representative.

- .2 Provide copies to subcontractor of work being inspected or tested.

1.6 TESTS AND MIX DESIGNS

- .1 Furnish test results and mix designs as requested.
- .2 Cost of tests and mix designs beyond those called for in Contract Documents or beyond those required by law of Place of Work will be appraised by Consultant and may be authorized as recoverable.

1.7 EQUIPMENT AND SYSTEMS

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

END OF SECTION

Part 1 General

1.1 REFERENCES

- .1 Canadian Standards Association (CSA International)
 - .1 CSA-A23.1/A23.2-14, Concrete Materials and Methods of Concrete Construction/Methods of Test and Standard Practices for Concrete.
 - .2 CSA-0121-17, Douglas Fir Plywood.
 - .3 CAN/CSA-S269.2-16, Access Scaffolding for Construction Purposes.
- .3 U.S. Environmental Protection Agency (EPA) / Office of Water
 - .1 EPA 832R92005, Storm Water Management for Construction Activities: Developing Pollution Prevention Plans and Best Management Practices.

1.2 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Provide submittals in accordance with Section 01 33 00 - Submittal Procedures.

1.3 INSTALLATION AND REMOVAL

- .1 Prepare site plan indicating proposed location and dimensions of area to be fenced and used by Contractor, number of trailers to be used, avenues of ingress/egress to fenced area and details of fence installation.
- .2 Identify areas which have to be gravelled to prevent tracking of mud.
- .3 Indicate use of supplemental or other staging area.
- .4 Provide construction facilities in order to execute work expeditiously.
- .5 Remove from site all such work after use.
- .6

1.4 ELEVATORS

- .1 Designated existing permanent freight elevators to be used by construction personnel and transporting of materials during the day, however it is a shared elevator and non-bookable. Co-ordinate use with MPLM.
- .2 Provide protective plywood coverings for finish surfaces of cars and entrances.

1.5 SITE STORAGE/LOADING

- .1 Confine work and operations of employees by Contract Documents. Do not unreasonably encumber premises with products.
- .2 Do not load or permit to load any part of Work with weight or force that will endanger Work.

1.6 CONSTRUCTION PARKING

- .1 Parking will not be supplied.
- .2 Provide and maintain adequate access to project site.

- .3 Clean runways and taxi areas where used by Contractor's equipment.

1.7 OFFICES

- .1 Provide marked and fully stocked first-aid case in a readily available location.
- .2 Subcontractors to provide their own offices as necessary. Direct location of these offices.

1.8 EQUIPMENT, TOOL AND MATERIALS STORAGE

- .1 Provide and maintain, in clean and orderly condition.
- .2 All materials to be stored on work site. No additional storage will be provided.

1.9 SANITARY FACILITIES

- .1 Designated sanitary facilities within the building will be available for worker use. Keep premises clean and sanitary at all times. Thoroughly clean prior to turn over.
- .2 Sanitary facilities are for personal worker use only. Do not use washrooms for dumping of liquids or for cleaning tools such as paint brushes.

1.10 CONSTRUCTION SIGNAGE

- .1 Project sign not required.
- .2 No company signs or signs for advertisements, other than warning signs, are permitted on site.
- .3 Signs and notices for safety and instruction shall be in both official languages Graphic symbols shall conform to CAN3-Z321.
- .4 Maintain approved signs and notices in good condition for duration of project, and dispose of offsite on completion of project or earlier if directed by Consultant.

1.11 CLEAN-UP

- .1 Remove construction debris, waste materials, packaging material from work site daily.
- .2 Clean dirt or mud tracked onto paved or surfaced roadways.
- .3 Store materials resulting from demolition activities that are salvageable.
- .4 Stack stored new or salvaged material not in construction facilities.

END OF SECTION

Part 1 General

1.1 REFERENCES

- .1 Canadian Standards Association (CSA International)
 - .1 CSA-O121-17, Douglas Fir Plywood.

1.2 INSTALLATION AND REMOVAL

- .1 Provide temporary controls in order to execute Work expeditiously.
- .2 Remove from site all such work after use.

1.3 DUST TIGHT SCREENS

- .1 Provide partition to localize dust generating activities, and for protection of workers, finished areas of Work and public.
- .2 Maintain and relocate protection until such work is complete.
- .3 Confirm locations and installation with Consultant at least 3 days prior to installation.
- .4 Where partitions restrict access to emergency exits review security requirements with Consultant prior to erection.

1.4 FIRE ROUTES

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

1.5 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.

1.6 PROTECTION OF BUILDING FINISHES

- .1 All interior and exterior finishes and fixtures that may be found outside of the scope of work and that may be at risk of damage during all phases of work, both demolition and new construction, due to passing of labour and materials, machinery and tool, to gain access to the site, are to be protected with the highest level of care and attention.
- .2 The buildings Main Entrance and Elevator Lobby are strictly off-limits to all demolition and construction personnel, equipment, and materials, at all time. Unless prior written authorization has been granted, with detailed description of reason for access to said areas.
- .2 Provide protection for finished and partially finished building finishes and equipment during performance of Work.
- .3 Provide necessary screens, covers, and hoardings.
- .4 Confirm with Consultant locations and installation schedule 3 days prior to installation.
- .5 Be responsible for damage incurred due to lack of or improper protection.

END OF SECTION

Part 1 General

1.1 REFERENCES

- .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 specifications.
- .3 If there is question as to whether products or systems are in conformance with applicable standards, Consultant reserves right to have such products or systems tested to prove or disprove conformance.
- .4 Cost for such testing will be borne by Owner in event of conformance with Contract Documents or by Contractor in event of non-conformance.

1.2 DEFINITIONS

- .1 New: Produced for new materials.
- .2 Renewed: Produced for rejuvenated from an existing material to like-new condition to serve a new or existing service.
- .3 Defective: A condition determined exclusively by the Consultant.
- .4 Workplace Hazardous Materials Information System (WHMIS): A Canada-wide system designed to give employers and workers information about hazardous materials used in the workplace. Under WHMIS, information on hazardous materials is to be provided on container labels, material safety data sheets (MSDS), and worker education programs. WHMIS is put into effect by a combination of federal and provincial laws.
- .5 Comply with Workplace Hazardous Materials Information System Regulation (WHMIS) Certified in accordance with the applicable legislation of the authority having jurisdiction.

1.3 QUALITY

- .1 Products, materials, equipment and articles (referred to as products throughout specifications) incorporated in Work shall be new, not damaged or defective, and of best quality (compatible with specifications) for purpose intended. If requested, furnish evidence as to type, source and quality of Products provided.
- .2 Defective products, whenever identified prior to completion of Work, will be rejected, regardless of previous inspections. Inspection does not relieve responsibility, but is against oversight or error. Remove and replace defective products at own expense and be responsible for delays and expenses caused by rejection.
- .3 Should any dispute arise as to quality or fitness of products, decision rests strictly with Consultant based upon requirements of Contract Documents.
- .4 Unless otherwise indicated in specifications, maintain uniformity of manufacture for any particular or like item throughout building.
- .5 Permanent labels, trademarks and nameplates on products are not acceptable in

prominent locations, except where required for operating instructions, or when located in mechanical or electrical rooms.

1.4 AVAILABILITY

- .1 Immediately upon signing Contract, review product delivery requirements and anticipate foreseeable supply delays for any items. If delays in supply of products are foreseeable, notify Consultant of such, in order that substitutions or other remedial action may be authorized in ample time to prevent delay in performance of Work.
- .2 Within 7 days of written request by Consultant, submit following information of materials and equipment proposed for supply:
 - .1 name and address of manufacturer,
 - .2 trade name, model and catalogue number,
 - .3 performance, descriptive and test data,
 - .4 manufacturer's installation or application instructions,
 - .5 evidence of arrangements to procure.
- .3 In event of failure to notify Consultant at commencement of Work and should it subsequently appear that Work may be delayed for such reason, Consultant reserves right to substitute more readily available products of similar character, at no increase in Contract Price or Contract Time.

1.5 STORAGE, HANDLING AND PROTECTION

- .1 Handle and store products in manner to prevent damage, adulteration, deterioration and soiling and in accordance with manufacturer's instructions when applicable.
- .2 Store packaged or bundled products in original and undamaged condition with manufacturer's seal and labels intact. Do not remove from packaging or bundling until required in Work.
- .3 Store products subject to damage from weather in weatherproof enclosures.
- .4 Store cementitious products clear of earth or concrete floors, and away from walls.
- .5 Keep sand, when used for grout or mortar materials, clean and dry. Store sand on wooden platforms and cover with waterproof tarpaulins during inclement weather.
- .6 Store sheet materials, lumber and panels on flat, solid supports and keep clear of ground. Slope to shed moisture.
- .7 Store and mix paints in heated and ventilated room. Remove oily rags and other combustible debris from site daily. Take every precaution necessary to prevent spontaneous combustion.
- .8 Remove and replace damaged products at own expense and to satisfaction of Consultant.
- .9 Touch-up damaged factory finished surfaces to Consultant's satisfaction. Use touch-up materials to match original. Do not paint over name plates.

1.6 TRANSPORTATION

- .1 Pay costs of transportation of products required in performance of Work.
- .2 Promptly inspect shipments to ensure product comply with requirements, quantities are correct, and products are undamaged.
- .3 Provide equipment and personnel to handle product by methods to prevent soiling, wet, disfigurement or damage.

1.7 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 Notify Consultant in writing, of conflicts between specifications and manufacturer's instructions, so that Consultant may establish course of action.
- .3 Improper installation or erection of products, due to failure in complying with these requirements, authorizes Consultant to require removal and re- installation at no increase in Contract Price or Contract Time.

1.8 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 Consultant if required Work is such as to make it impractical to produce required results.
- .2 Do not employ anyone unskilled in their required duties. Consultant reserves right to require dismissal from site, workers deemed incompetent or careless.
- .3 Decisions as to standard or fitness of Quality of Work in cases of dispute rest solely with Consultant, whose decision is final.

1.9 CO-ORDINATION

- .1 Ensure cooperation of workers in laying out Work. Maintain efficient and continuous supervision.
- .2 Be responsible for coordination and placement of openings, sleeves and accessories.

1.10 CONCEALMENT

- .1 In finished areas, conceal pipes, ducts and wiring in floors, walls and ceilings, except where indicated otherwise.
- .2 Before installation, inform Consultant if there is interference. Install as directed by Consultant.

1.11 REMEDIAL WORK

- .1 Perform remedial work required to repair or replace parts or portions of Work identified as defective or unacceptable. Coordinate adjacent affected Work as required.
- .2 Perform remedial work by specialists familiar with materials affected. Perform in a manner to neither damage nor put at risk any portion of Work.

1.12 LOCATION OF FIXTURES

- .1 Consider location of fixtures, outlets, and mechanical and electrical items indicated as approximate.
- .2 Inform Consultant of conflicting installation. Install as directed.

1.13 FASTENINGS

- .1 Provide metal fastenings and accessories in same texture, colour and finish as adjacent, 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 exterior work, unless stainless steel or other material is specifically requested in affected specification Section.
- .4 Space anchors within individual load limit or shear capacity and ensure they provide positive permanent anchorage. Wood, or any other organic material plugs are not acceptable.
- .5 Generally, conceal fasteners. Keep exposed fastenings to a minimum, space evenly and install neatly.
- .6 Fastenings which cause spalling or cracking of material to which anchorage is made are not acceptable.

1.14 FASTENINGS – EQUIPMENT

- .1 Use fastenings of standard commercial sizes and patterns with material and finish suitable for service.
- .2 Bolts may not project more than one diameter beyond nuts.
- .3 Use plain type washers on equipment, sheet metal and soft gasket lock type washers where vibrations occur. Use resilient washers with stainless steel.

1.15 PROTECTION OF WORK IN PROGRESS

- .1 Prevent overloading of any part of building. Do not cut, drill or sleeve any load bearing structural member, unless specifically indicated without written approval of Consultant.
- .2 Adequately protect Work completed or in progress. Work damaged or defaced due to failure in is to be removed and replaced, or repaired, as directed by Consultant, at no increase in Contract Price or Contract Time.

1.16 CONTRACTOR'S OPTIONS FOR SELECTION OF MATERIALS

- .1 The Consultant's decision shall be final and conclusive in respect of the work in accordance with General Conditions, including whether or not the quality of any materials supplied or proposed to be supplied meets the requirements of the contract.
- .2 When materials are specified by referenced standard, select any material that meets or exceeds the specified standard.
- .3 The terms "Acceptable Material", "Acceptable Product", and "Standard of Acceptance" are each deemed to be a complete and working commodity as described by a manufacturer's name, catalogue number, trade name or any combination thereof. Any

such named materials may be selected by the Contractor.

- .4 Where materials are required to be listed on the "Canadian General Standards Board, Qualified Products List" select any manufacturer so listed.
- .5 Materials specified by "Prescriptive" or "Performance" specification select any material meeting or exceeding specification. When materials are specified by a Standard, Prescriptive or Performance specifications, upon request of the Consultant, obtain from manufacturer an independent testing laboratory reporting, showing that the material or equipment meets or exceeds the specified requirements.

1.17 SUBSTITUTION

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

1.18 CONSTRUCTION EQUIPMENT AND PLANT

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

END OF SECTION

Part 1 General

1.1 PROJECT CLEANLINESS

- .1 Maintain Work in tidy condition, free from accumulation of waste products and debris, including that caused by Owner or other Contractors.
- .2 Remove waste materials from site at daily regularly scheduled times or dispose of as directed by Consultant. Do not burn waste materials on site, unless approved by Consultant.
- .3 Make arrangements with and obtain permits from authorities having jurisdiction for disposal of waste and debris.
- .4 Provide on-site containers for collection of waste materials and debris.
- .5 Provide and use marked separate bins for recycling. Refer to Section (01 74 21 - Construction/Demolition Waste Management and Disposal.)
- .6 Dispose of waste materials and debris.
- .7 Clean interior areas prior to start of finishing work, and maintain areas free of dust and other contaminants during finishing operations.
- .8 Store volatile waste in covered metal containers, and remove from premises at end of each working day.
- .9 Provide adequate ventilation during use of volatile or noxious substances. Use of building ventilation systems is not permitted for this purpose.
- .10 Use only cleaning materials recommended by manufacturer of surface to be cleaned, and as recommended by cleaning material manufacturer.
- .11 Schedule cleaning operations so that resulting dust, debris and other contaminants will not fall on wet, newly painted surfaces nor contaminate building systems.

1.2 FINAL CLEANING

- .1 When Work is Substantially Performed remove surplus products, tools, construction machinery and equipment not required for performance of remaining Work.
- .2 Remove waste products and debris other than that caused by others, and leave Work clean and suitable for occupancy.
- .3 Prior to final review remove surplus products, tools, construction machinery and equipment.
- .4 Remove waste products and debris other than that caused by Consultant, Tenants, or other Contractors.
- .5 Remove waste materials from site at regularly scheduled times or dispose of as directed by Consultant. Do not burn waste materials on site, unless approved by Consultant.
- .6 Make arrangements with and obtain permits from authorities having jurisdiction

for disposal of waste and debris.

- .7 Clean and polish glass, mirrors, hardware, wall tile, stainless steel, chrome, porcelain enamel, baked enamel, plastic laminate, and mechanical and electrical fixtures. Replace broken, scratched or disfigured glass.
- .8 Remove stains, spots, marks and dirt from decorative work, electrical and mechanical fixtures, furniture fitments, walls, basement floors fourth floor.
- .9 Clean lighting reflectors, lenses, and other lighting surfaces.
- .10 Vacuum clean and dust building interiors, behind grilles, louvres and screens.
- .11 Wax, seal, shampoo or prepare floor finishes, as recommended by manufacturer.
- .12 Inspect finishes, fitments and equipment and ensure specified workmanship and operation.
- .13 Broom clean and wash exterior walks, steps and surfaces; rake clean other surfaces of grounds.
- .14 Remove dirt and other disfiguration from exterior surfaces.
- .15 Clean and sweep roofs, gutters, areaways, and sunken wells.
- .16 Sweep and wash clean paved areas.
- .17 Clean equipment and fixtures to sanitary condition; clean or replace filters of mechanical equipment.
- .18 Clean roofs, downspouts, and drainage systems.
- .19 Remove debris and surplus materials from crawl areas and other accessible concealed spaces.
- .20 Remove snow and ice from access to building.

1.3 WASTE MANAGEMENT AND DISPOSAL

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

END OF SECTION

Part 1 General

1.1 WASTE MANAGEMENT GOALS

- .1 Prior to start of Work conduct meeting with Consultant to review and discuss VAC's waste management goal and Contractor's proposed Waste Reduction Workplan for Construction, Renovation and /or Demolition (CRD) waste to be project generated.
- .2 VAC's waste management goal: to divert a minimum 75 percent of total Project Waste from landfill sites. Prior to project completion provide Consultant documentation certifying that waste management, recycling, reuse of recyclable and reusable materials have been extensively practiced. The overall waste diversion goal for this project is 75%.
- .3 Specific material target percentages for reuse and/or recycling:
 - .1 Ceilings and walls: 75%.
 - .2 Metals: 100%.
 - .3 Mechanical - HVAC: 80%.
 - .4 Mechanical - plumbing piping: 100%.
 - .5 Mechanical - fixtures: 100%.
 - .6 Doors and windows: 90%.
 - .7 Finish carpentry and millwork: 50%.
 - .8 Flooring: 75%.
 - .9 Electrical - wiring/conduits/boxes: 75%.
 - .10 Electrical - lighting: 90%.
 - .11 Miscellaneous - furnishing/specialized equipment: 50 %.
 - .12 Packaging: 75%.
- .4 Target percentage goals are achievable for waste diversion. Contractor to review and confirm with Consultant Waste Audit acceptable values.
- .5 Minimize amount of non-hazardous solid waste generated by project and accomplish maximum source reduction, reuse and recycling of solid waste produced by CRD activities.
- .6 Protect environment and prevent environmental pollution damage.

1.2 REFERENCES

- .1 Definitions:

-
- .1 Approved/Authorized recycling facility: waste recycler approved by applicable provincial authority or other users of material for recycling approved by the Consultant.
 - .2 Class III: non-hazardous waste - construction renovation and demolition waste.
 - .3 Construction, Renovation and/or Demolition (CRD) Waste: Class III solid, non-hazardous waste materials generated during construction, demolition, and/or renovation activities
 - .4 Cost/Revenue Analysis Work Plan (CRAW): based on information from Waste Reduction Work Plan, and intended as financial tracking tool for determining economic status of waste management practices (Schedule E).
 - .5 Inert Fill: inert waste - exclusively asphalt and concrete.
 - .6 Waste Source Separation Program (WSSP): implementation and co-ordination of ongoing activities to ensure designated waste materials will be sorted into pre-defined categories and sent for recycling and reuse, maximizing diversion and potential to reduce disposal costs.
 - .7 Recyclable: ability of product or material to be recovered at end of its life cycle and re-manufactured into new product for reuse.
 - .8 Recycle: process by which waste and recyclable materials are transformed or collected for purpose of being transferred into new products.
 - .9 Recycling: process of sorting, cleansing, treating and reconstituting solid waste and other discarded materials for purpose of using in altered form. Recycling does not include burning, incinerating, or thermally destroying waste.
 - .10 Reuse: repeated use of product in same form but not necessarily for same purpose. Reuse includes:
 - .1 Salvaging reusable materials from re-modelling projects, before demolition stage, for resale, reuse on current project or for storage for use on future projects.
 - .2 Returning reusable items including pallets or unused products to vendors.
 - .11 Salvage: removal of structural and non-structural materials from deconstruction/disassembly projects for purpose of reuse or recycling.
 - .12 Separate Condition: refers to waste sorted into individual types.
 - .13 Source Separation: act of keeping different types of waste materials separate beginning from the point they became waste.
 - .14 Waste Audit (WA): detailed inventory of estimated quantities of waste materials that will be generated during construction, demolition, deconstruction and/or

renovation. Involves quantifying by volume/weight amounts of materials and wastes that will be reused, recycled or landfilled. Refer to Schedule A.

- .15 Waste Diversion Report: detailed report of final results, quantifying cumulative weights and percentages of waste materials reused, recycled and landfilled over course of project. Measures success against Waste Reduction Workplan (WRW) goals and identifies lessons learned.
- .16 Waste Management Coordinator (WMC): contractor representative responsible for supervising waste management activities as well as coordinating required submittal and reporting requirements.
- .17 Waste Reduction Work Plan (WRW): written report which addresses opportunities for reduction, reuse, or recycling of materials generated by project. Specifies diversion goals, implementation and reporting procedures, anticipated results and responsibilities. Waste Reduction Work Plan (Schedule B) information acquired from Waste Audit.
- .2 Reference Standards:
 - .1 Ontario Ministry of Environment
 - .1 Canadian Construction Association (CCA)
 - .1 CCA 81-2001: A Best Practices Guide to Solid Waste Reduction.

1.3 DOCUMENTS

- .1 Post and maintain in visible and accessible area at job site, one copy of following documents:
 - .1 Waste Audit (Schedule A).
 - .2 Waste Reduction Work Plan (Schedule B).
 - .3 Waste Source Separation Program.
 - .4 Schedules A and B completed for project.

1.4 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Submit in accordance with Section 01 33 00 – Submittal procedures
- .2 Prepare and submit following prior to project start-up:
 - .1 1 copy and 1 electronic copy of completed Waste Audit (WA): Schedule A.
 - .2 1 copy and 1 electronic copy of completed Waste Reduction Work Plan (WRW): Schedule B.
 - .3 1 copy and 1 electronic copy of Cost/Revenue Analysis Work Plan (CRAW): Schedule E.
 - .4 1 copy and 1 electronic copy of Waste Source Separation Program (WSSP).
- .3 Prepare and submit on bi-weekly basis, throughout project or at intervals agreed to by

Consultant the following:

- .1 Receipts, scale tickets, waybills, and/or waste disposal receipts that show quantities and types of materials reused, recycled, or disposed of.
- .2 Updated Waste Materials Tracking form (Schedule D).
- .3 Written bi-weekly summary report detailing cumulative amounts of waste materials reused, recycled and landfilled, and brief status of ongoing waste management activities.
- .4 Submit prior to final payment the following:
 - .1 Waste Diversion Report, indicating final quantities by material types salvaged for reuse, recycling or disposal in landfill and recycling centres, re-use depots, landfills and other waste processors that received waste materials (See Schedule C).
 - .2 Provide receipts, scale tickets, waybills, waste disposal receipts that confirm quantities and types of materials reused, recycled or disposed of and destination.

1.5 WASTE AUDIT (WA)

- .1 WA provides detailed inventory, estimated quantities and types of waste materials that will be generated as well as their potential to be reused and/or recycled and project's waste diversion goals and objectives.
- .2 After award of contract, contractor to review WA and confirm that anticipated quantities of waste generated are accurate and goals achievable.
- .3 If after review, contractor determines that indicated quantities or opportunities in WA are not accurate or achievable, contractor to provide written details of discrepancies and revised quantities for areas of concern. Contractor to meet with Consultant to review and justify revisions.
- .4 Post on-site WA where contractor and sub-contractors are able to review content.

1.6 WASTE REDUCTION WORKPLAN (WRW)

- .1 Prepare and submit WRW (Schedule B) at least 10 days prior to project start-up.
- .2 WRW identifies strategies to optimize diversion through reduction, reuse, and recycling of materials and comply with applicable regulations, based on information acquired from WA.
- .3 WRW should include but not limited to:
 - .1 Applicable regulations.
 - .2 Specific goals for waste reduction, identify existing barriers and develop strategies to overcome them.
 - .3 Destination of materials identified.

- .4 Deconstruction/disassembly techniques and schedules.
- .5 Methods to collect, separate, and reduce generated wastes.
- .6 Location of waste bins on-site.
- .7 Security of on-site stock piles and waste bins.
- .8 Protection of personnel, sub-contractors.
- .9 Clear labelling of storage areas.
- .10 Training plan for contractor and sub-contractors.
- .11 Methods to track and report results reliably (Schedule D).
- .12 Details on materials handling and removal procedures.
- .13 Recycler and reclaimer requirements.
- .14 Quantities of materials to be salvaged for reuse or recycled and materials sent to landfill.
- .15 Requirements for monitoring on-site wastes management activities.
- .4 Structure WRW to prioritize actions and follow 3R's hierarchy, with Reduction as first priority, followed by Reuse, then Recycle.
- .5 Post WRW or summary where workers at site are able to review content.
- .6 Monitor and report on waste reduction by documenting total volume (in tonnes) and cost of actual waste removed from project (Schedule D).

1.7 WASTE SOURCE SEPARATION PROGRAM (WSSP)

- .1 As part of Waste Reduction Work Plan, prepare WSSP prior to project start-up.
- .2 WSSP will detail methodology and planned on-site activities for separation of reusable and recyclable materials from waste intended for landfill.
- .3 Provide list and drawings of locations that will be made available for sorting, collection, handling and storage of anticipated quantities of reusable and recyclable materials.
- .4 Provide sufficient on-site facilities and containers for collection, handling, and storage of anticipated quantities of reusable and recyclable materials.
- .5 Locate containers to facilitate deposit of materials without hindering daily operations.
- .6 Provide training for workers in handling and separation of materials for reuse and/or recycling.
- .7 Locate separated materials in areas which minimizes material damage.
- .8 Clearly and securely label containers to identify types/conditions of materials accepted and assist sub-contractors in separating materials accordingly.
- .9 Monitor on-site waste management activities by conducting periodic site inspections to verify: state of signage, contamination levels, bin locations and condition, personnel

participation, use of waste tracking forms and collection of waybills, receipts and invoices.

- .10 On-site sale of salvaged materials is not permitted unless authorized in writing by Consultant and provided that site safety regulations and security requirements are adhered to.

1.8 USE OF SITE AND FACILITIES

- .1 Execute Work with minimal interference and disturbance to normal use of premises.
- .2 Maintain security measures established by facility provide temporary security measures approved by Consultant.

1.9 WASTE PROCESSING SITES

- .1 Contractor is responsible to research and locate waste diversion resources and service providers. Salvaged materials are to be transported off site to approved and/or authorized recycling facilities or to users of material for recycling.

1.10 QUALITY ASSURANCE

- .1 After award of Contract, a mandatory site examination will be held for this Project for Contractor and/or sub-contractors responsible for construction, renovation demolition/deconstruction waste management.
 - .1 Date, time and location will be arranged by Consultant.
- .2 Waste Management Meeting:
Waste Management Coordinator is to provide an update on status of waste diversion and management activities at each meeting. Written bi- weekly Waste Diversion Report summary to be provided by Waste Management Coordinator (refer to the Waste Diversion Report form in Schedule C and Waste Materials Tracking form in Schedule D).

1.11 STORAGE, HANDLING AND PROTECTION

- .1 Store, materials to be reused, recycled and salvaged in locations as directed by Consultant.
- .2 Unless specified otherwise, materials for removal do not become Contractor's property.
- .3 Protect, stockpile, store and catalogue salvaged items.
- .4 Separate non-salvageable materials from salvaged items. Transport and deliver non-salvageable items to licensed disposal facility.
- .5 Protect structural components not removed and salvaged materials from movement or damage.
- .6 Support affected structures. If safety of building is endangered, cease operations and immediately notify Consultant.
- .7 Protect surface drainage, mechanical and electrical from damage and blockage.

- .8 Provide on-site facilities and containers for collection and storage of reusable and recyclable materials.
- .9 Separate and store materials produced during project in designated areas.
- .10 Prevent contamination of materials to be salvaged and recycled and handle materials in accordance with requirements for acceptance by designated processing facilities.
 - .1 On-site source separation is recommended.
 - .2 Remove co-mingled materials to offsite processing facility for separation.
 - .3 Obtain waybills, receipts and/or scale tickets for separated materials removed from site.
 - .4 Materials reused on-site are considered to be diverted from landfill and as such are to be included in all reporting.

1.12 DISPOSAL OF WASTES

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

1.13 SCHEDULING

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

Part 2 Execution

2.1 APPLICATION

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

2.2 CLEANING

- .1 Progress Cleaning: clean in accordance with Section 01 74 11 - Cleaning.
 - .1 Leave Work area clean at end of each day.
- .2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 74 11 - Cleaning.
- .3 Waste Management: separate waste materials for reuse recycling in accordance with Section 01 74 21 - Construction/Demolition Waste Management and Disposal.
 - .1 Remove recycling containers and bins from site and dispose of materials at appropriate facility.
 - .2 Source separate materials to be reused/recycled into specified sort areas.

2.3 DIVERSION OF MATERIALS

- .1 From following list, separate materials from general waste stream and stockpile in separate piles or containers, as reviewed by Consultant, and consistent with applicable fire regulations.
 - .1 Mark containers or stockpile areas.
 - .2 Provide instruction on disposal practices.
- .2 On-site sale of salvaged recovered reusable recyclable materials is not permitted.

2.4 WASTE DIVERSION REPORT

- .1 At completion of Project, prepare written Waste Diversion Report indicating quantities of materials reused, recycled or disposed of as well as the following:
 - .1 Identify final diversion results and measure success against goals from Waste Reduction Work Plan.
 - .2 Compare final quantities/percentages diverted with initial projections in Waste Audit and Waste Reduction Work Plan and explain variances.
 - .1 Supporting documentation.
 - .2 Waybills and tracking forms.
 - .3 Description of issues, resolutions and lessons learned.

2.5 WASTE AUDIT (WA)

- .1 Schedule A - Waste Audit (WA)

(1) Material Category	(2) Material Quantity Unit	(3) Estimated Waste %	(4) Total Quantity of Waste (unit)	(5) Generation Point	(6) % Recycled	(7) % Reused
Wood & Plastics Material Description						
Warped Pallet Forms						
Plastic Packaging						
Cardboard Packaging						
Doors & Windows Material Description						
Painted Frames						

2.6 WASTE REDUCTION WORKPLAN (WRW)

.1 Schedule B

(1) Material Category	(2) Person(s) Responsible	(3) Total Quantity of Waste (unit)	(4) Reused Amount (units)	Actual	(5) Recycled Amount (unit)	Actual	(6) Material(s) Destination
Wood & Plastics Material Description							
Warped Pallet Forms							
Plastic Packaging							

Cardboard Packaging							
Doors & Windows Material Description							
Painted Frames							

2.6 CANADIAN GOVERNMENTAL DEPARTMENTS CHIEF RESPONSIBILITY FOR THE ENVIRONMENT

.1 Schedule G - Government Chief Responsibility for the Environment:

Manitoba	Sustainable Development, 200 Saulteaux Crescent Winnipeg MB R 3 J 3W3	204-945-6784 800-214-6497	
	Environment Canada Toronto ON	416-734-4494	

2.7 SCHEDULES

.1 Following Schedules are attached to this Specification:

- .1 Waste Audit - Schedule A.
- .2 Waste Reduction Workplan Form - Schedule B.
- .3 Waste Diversion Report Form - Schedule C.
- .4 Waste Materials Tracking Form - Schedule D.
- .5 Market Research Report - Schedule F (When Available).

END OF SECTION

Part 1 General

1.1 REFERENCES

- .1 Canadian Environmental Protection Act (CEPA)
- .1 SOR/2008-197, Storage Tank Systems for Petroleum Products and Allied Petroleum Products Regulations.

1.2 ADMINISTRATIVE REQUIREMENTS

- .1 Acceptance of Work Procedures:
 - .1 Contractor's Inspection: Contractor: conduct inspection of Work, identify deficiencies and defects, and repair as required to conform to Contract Documents.
 - .1 Notify Consultant in writing of satisfactory completion of Contractor's inspection and submit verification that corrections have been made.
 - .2 Request Consultant inspection.
 - .2 Consultant Inspection:
 - .1 Consultant 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, adjusted, balanced, and fully operational.
 - .4 Certificates required by Fire Commissioner: submitted.
 - .5 Operation of systems: demonstrated to Owner's personnel.
 - .6 Commissioning of mechanical systems: completed in accordance with 01 91 13 - General Commissioning (Cx) Requirements and copies of final Commissioning Report submitted to Consultant.
 - .7 Work: complete and ready for final inspection.
 - .4 Final Inspection:
 - .1 When completion tasks are done, request final inspection of Work by Consultant, and Contractor.

- .2 When Work incomplete according to Consultant, complete outstanding items and request re-inspection.
- .5 Declaration of Substantial Performance: when Consultant considers deficiencies and defects corrected and requirements of Contract substantially performed, make application for Certificate of Substantial Performance.
- .6 Commencement of Lien and Warranty Periods: date of Owner's acceptance of submitted declaration of Substantial Performance to be date for commencement for warranty period and commencement of lien period unless required otherwise by lien statute of Place of Work.
- .7 Final Payment:
 - .1 When Consultant considers final deficiencies and defects corrected and requirements of Contract met, make application for final payment.
 - .2 Refer to requirements of GP & S: when Work deemed incomplete by Consultant, complete outstanding items and request re-inspection.
- .8 Payment of Holdback: after issuance of Certificate of Substantial Performance of Work, submit application for payment of holdback amount in accordance with contractual agreement.

1.3 FINAL CLEANING

- .1 Clean in accordance with Section 01 74 11 - Cleaning.
 - .1 Remove surplus materials, excess materials, rubbish, tools and equipment.
- .2 Waste Management: separate waste materials for reuse, recycling in accordance with Section 01 74 21 - Construction/Demolition Waste Management and Disposal.

END OF SECTION

Part 1 General

1.1 REFERENCES

- .1 Canadian Environmental Protection Act (CEPA)
 - .1 SOR/2008-197, Storage Tank Systems for Petroleum Products and Allied Petroleum Products Regulations.

1.2 ADMINISTRATIVE REQUIREMENTS

- .1 Pre-warranty Meeting:
 - .1 Convene meeting one week prior to contract completion with Consultant, in accordance with Section 01 31 19 - Project Meetings to:
 - .1 Verify Project requirements.
 - .2 Review warranty requirements, manufacturer's installation instructions.
- .2 Consultant to establish communication procedures for:
 - .1 Notifying construction warranty defects.
 - .2 Determine priorities for type of defects.
 - .3 Determine reasonable response time.
- .3 Contact information for bonded and licensed company for warranty work action: provide name, telephone number and address of company authorized for construction warranty work action.
- .4 Ensure contact is located within local service area of warranted construction, is continuously available, and is responsive to inquiries for warranty work action.

1.3 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Provide submittals in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Two weeks prior to Substantial Performance of the Work, submit to the Consultant, four final copies of operating and maintenance manuals in English.
- .3 Provide spare parts, maintenance materials and special tools of same quality and manufacture as products provided in Work.
- .4 Provide evidence, if requested, for type, source and quality of products supplied.

1.4 O & M MAUNUAL: FORMAT

- .1 Refer to O&M Manual Checklist and CMMS form
- .2 Binders: vinyl, hard covered, 3 'D' ring, loose leaf 219 x 279 mm with spine and face pockets.
- .3 When multiple binders are used correlate data into related consistent groupings, Identify contents of each binder on spine.
- .4 Cover: identify each binder with type or printed title 'Project Record Documents'; list title of project and identify subject matter of contents.

- .5 Arrange content by systems under Section numbers and sequence of Table of Contents.
- .6 Provide tabbed fly leaf for each separate product and system, with typed description of product and major component parts of equipment.
- .7 Text: manufacturer's printed data, or typewritten data.
- .8 Drawings: provide with reinforced punched binder tab. Bind in with text; fold larger drawings to size of text pages.
- .9 Provide 1:1 scaled CAD files in dwg format on CD.

1.5 CONTENTS - PROJECT RECORD DOCUMENTS

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

1.6 AS -BUILT DOCUMENTS AND SAMPLES

- .1 Maintain, in addition to requirements in General Conditions, at site for Consultant one record copy of:
 - .1 Contract Drawings.
 - .2 Specifications.
 - .3 Addenda.
 - .4 Change Orders and other modifications to Contract.
 - .5 Reviewed shop drawings, product data, and samples.
 - .6 Field test records.
 - .7 Inspection certificates.

- .8 Manufacturer's certificates.
- .2 Store record documents and samples in field office apart from documents used for construction.
 - .1 Provide files, racks, and secure storage.
- .3 Label record documents and file in accordance with Section number listings in List of Contents of this Project Manual.
 - .1 Label each document "PROJECT RECORD" in neat, large, printed letters.
- .4 Maintain record documents in clean, dry and legible condition.
 - .1 Do not use record documents for construction purposes.
- .5 Keep record documents and samples available for inspection by Consultant.
- .6 Provide a detailed Heritage Building Material Inventory; written report with photographs and drawings, which clearly identifies where reclaimed heritage elements were found, why they were removed, and where they will be stored once the project is complete. Photographs are required to be taken prior to the removal of any heritage finishes or fixtures, complete with detailed drawing, including a detailed description of where reclamation occurred.

1.7 RECORDING INFORMATION ON PROJECT RECORD DOCUMENTS

- .1 Record information on set of blue line opaque drawings, and in copy of Project Manual, provided by Consultant.
- .2 Use felt tip marking pens, maintaining separate colours for each major system, for recording information.
- .3 Record information concurrently with construction progress.
 - .1 Do not conceal Work until required information is recorded.
- .4 Contract Drawings and shop drawings: mark each item to record actual construction, including:
 - .1 Measured depths of elements of foundation in relation to finish first floor datum.
 - .2 Measured horizontal and vertical locations of underground utilities and appurtenances, referenced to permanent surface improvements.
 - .3 Measured locations of internal utilities and appurtenances, referenced to visible and accessible features of construction.
 - .4 Field changes of dimension and detail.
 - .5 Changes made by change orders.
 - .6 Details not on original Contract Drawings.
 - .7 References to related shop drawings and modifications.

- .5 Specifications: mark each item to record actual construction, including:
 - .1 Manufacturer, trade name, and catalogue number of each product actually installed, particularly optional items and substitute items.
 - .2 Changes made by Addenda and change orders.
- .6 Other Documents: maintain manufacturer's certifications, inspection certifications, field test records, required by individual specifications sections.
- .7 Provide digital photos, if requested, for site records.

1.8 EQUIPMENT AND SYSTEMS

- .1 For each item of equipment and each system include description of unit or system, and component parts.
 - .1 Give function, normal operation characteristics and limiting conditions.
 - .2 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.
 - .1 Include regulation, control, stopping, shut-down, and emergency instructions.
 - .2 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 co-ordination drawings, with installed colour coded piping diagrams.
- .12 Provide charts of valve tag numbers, with location and function of each valve, keyed to flow and control diagrams.
- .13 Provide list of original manufacturer's spare parts, current prices, and recommended quantities to be maintained in storage.

- .14 Include test and balancing reports as specified in Section 01 45 00 - Quality Control.
- .15 Additional requirements: as specified in individual specification sections.

1.9 MATERIALS AND FINISHES

- .1 Building products, applied materials, and finishes: include product data, with catalogue number, size, composition, and colour and texture designations.
 - .1 Provide information for re-ordering custom manufactured products.
- .2 Instructions for cleaning agents and methods, precautions against detrimental agents and methods, and recommended schedule for cleaning and maintenance.
- .3 Moisture-protection and weather-exposed products: include manufacturer's recommendations for cleaning agents and methods, precautions against detrimental agents and methods, and recommended schedule for cleaning and maintenance.
- .4 Additional requirements: as specified in individual specifications sections.

1.10 MAINTENANCE MATERIALS

- .1 Spare Parts:
 - .1 Provide spare parts, in quantities specified in individual specification sections.
 - .2 Provide items of same manufacture and quality as items in Work.
 - .3 Deliver to location as directed; place and store.
 - .4 Receive and catalogue items.
 - .1 Submit inventory listing to Consultant.
 - .2 Include approved listings in Maintenance Manual.
 - .5 Obtain receipt for delivered products and submit prior to final payment.
- .2 Extra Stock Materials:
 - .1 Provide maintenance and extra materials, in quantities specified in individual specification sections.
 - .2 Provide items of same manufacture and quality as items in Work.
 - .3 Deliver to location as directed; place and store.
 - .4 Receive and catalogue items.
 - .1 Submit inventory listing to Consultant.
 - .2 Include approved listings in Maintenance Manual.
 - .5 Obtain receipt for delivered products and submit prior to final payment.
- .3 Special Tools:

- .1 Provide special tools, in quantities specified in individual specification section.
- .2 Provide items with tags identifying their associated function and equipment.
- .3 Deliver to location as directed; place and store.
- .4 Receive and catalogue items.
 - .1 Submit inventory listing to Consultant.
 - .2 Include approved listings in Maintenance Manual.

1.11 DELIVERY, STORAGE AND HANDLING

- .1 Store spare parts, maintenance materials, and special tools in manner to prevent damage or deterioration.
- .2 Store in original and undamaged condition with manufacturer's seal and labels intact.
- .3 Store components subject to damage from weather in weatherproof enclosures.
- .4 Store paints and freezable materials in a heated and ventilated room.
- .5 Remove and replace damaged products at own expense and for review by Consultant.

1.13 WARRANTIES AND BONDS

- .1 Develop warranty management plan to contain information relevant to Warranties.
- .2 Submit warranty management plan, 30 days before planned pre-warranty conference, to Consultant approval.
- .3 Warranty management plan to include required actions and documents to assure that Consultant receives warranties to which it is entitled.
- .4 Provide plan in narrative form and contain sufficient detail to make it suitable for use by future maintenance and repair personnel.
- .5 Submit, warranty information made available during construction phase, to Consultant for approval prior to each monthly pay estimate.
- .6 Assemble approved information in binder, submit upon acceptance of work and organize binder as follows:
 - .1 Separate each warranty or bond with index tab sheets keyed to Table of Contents listing.
 - .2 List subcontractor, supplier, and manufacturer, with name, address, and telephone number of responsible principal.
 - .3 Obtain warranties and bonds, executed in duplicate by subcontractors, suppliers, and manufacturers, within [ten] days after completion of applicable item of work.
 - .4 Verify that documents are in proper form, contain full information, and are notarized.
 - .5 Co-execute submittals when required.

- .6 Retain warranties and bonds until time specified for submittal.
- .7 Except for items put into use with Owner's permission, leave date of beginning of time of warranty until Date of Substantial Performance is determined.
- .8 Conduct joint 4-month and 9-month warranty inspection, measured from time of acceptance, by Consultant.
- .9 Include information contained in warranty management plan as follows:
 - .1 Roles and responsibilities of personnel associated with warranty process, including points of contact and telephone numbers within the organizations of Contractors, subcontractors, manufacturers or suppliers involved.
 - .2 Listing and status of delivery of Certificates of Warranty for extended warranty items, to include HVAC balancing, commissioned systems, fire protection, alarm systems, sprinkler systems, lightning protection systems.
 - .3 Provide list for each warranted equipment, item, feature of construction or system indicating:
 - .1 Name of item.
 - .2 Model and serial numbers.
 - .3 Location where installed.
 - .4 Name and phone numbers of manufacturers or suppliers.
 - .5 Names, addresses and telephone numbers of sources of spare parts.
 - .6 Warranties and terms of warranty: include one-year overall warranty of construction. Indicate items that have extended warranties and show separate warranty expiration dates.
 - .7 Cross-reference to warranty certificates as applicable.
 - .8 Starting point and duration of warranty period.
 - .9 Summary of maintenance procedures required to continue warranty in force.
 - .10 Cross-Reference to specific pertinent Operation and Maintenance manuals.
 - .11 Organization, names and phone numbers of persons to call for warranty service.
 - .12 Typical response time and repair time expected for various warranted equipment.
 - .4 Contractor's plans for attendance at 4 and 9-month post-construction warranty inspections.
 - .5 Procedure and status of tagging of equipment covered by extended warranties.

- .6 Post copies of instructions near selected pieces of equipment where operation is critical for warranty and/or safety reasons.
- .10 Respond in timely manner to oral or written notification of required construction warranty repair work.
- .11 Written verification to follow oral instructions.
 - .1 Failure to respond will be cause for the Consultant to proceed with action against Contractor.

1.14 WARRANTY TAGS

- .1 Tag, at time of installation, each warranted item. Provide durable, oil and water-resistant tag approved by Consultant.
- .2 Attach tags with copper wire and spray with waterproof silicone coating.
- .3 Leave date of acceptance until project is accepted for occupancy.
- .4 Indicate following information on tag:
 - .1 Type of product/material.
 - .2 Model number.
 - .3 Serial number.
 - .4 Contract number.
 - .5 Warranty period.
 - .6 Inspector's signature.
 - .7 Construction Contractor.

END OF SECTION

PART 1 COMMISSIONING REQUIREMENTS

1.1 GENERAL

This section contains general requirements for commissioning the facility's systems and components.

1.2 DESCRIPTION

- 1.2.1 The purpose of the Commissioning process is to provide the Owner of the facility with the assurance that the building systems have been installed according to the Contract Documents and will operate within the performance guidelines set out in the Design Intent and the Specifications. The Commissioning process does not reduce the responsibility of the installing Contractors to provide a fully functional finished product in accordance with the Contract Documents.
- 1.2.2 Commissioning is intended to enhance the quality of system start-up and aid in the orderly completion of system installation for the benefit of the Owner.
- 1.2.3 Commissioning shall ensure that systems operate according to design specifications and are capable of meeting all objectives under all resulting operating conditions.
- 1.2.4 All Contractors and related subcontractors shall be responsible for cooperating and coordinating their work with the commissioning team. They shall be responsible for carrying out all the physical activities required for the initial installation of components and systems, and for operating the systems as required during the commissioning process as instructed by the Commissioning Team.

1.3 REFERENCES

- 1.3.1 Associated Air Balance Council (AABC): National Standards for Field Measurements and Instrumentation, Total Systems Balance, Air Distribution- Hydronics Systems.
- 1.3.2 CSA Z320-11 – Building Commissioning Standards
- 1.3.3 ASHRAE 202-2013 – Commissioning Process for Building and Systems

1.4 QUALITY ASSURANCE

- 1.4.1 Cooperate with testing organization services under provisions specified in Section 01450 — Quality Control.
- 1.4.2 Testing organization: current member in good standing of AABC certified to perform specified services.
- 1.4.3 Comply with applicable procedures and standards of the certification sponsoring association.
- 1.4.4 Perform services under direction of supervisor qualified under certification

requirements of sponsoring association.

- 1.4.5 Equipment shall not be started up for temporary use until pre-start-up checklists and procedures from the manufacturer have been completed, and moisture, dust, and other environmental/building integrity issues have been addressed.
- 1.4.6 Functional performance testing will be completed under observation of the Commissioning Authority, following the completion of all pre-functional, start-up, and testing & air-balancing procedures for the entire system.
- 1.4.7 Equipment and its associated controls will be functionally tested following the calibration and completion of pre-functional checklists for the entire system.

1.5 SYSTEMS TO BE COMMISSIONED

- 1.5.1 Door Hardware
Operable Partitions
- 1.5.2 Life Safety Systems
- 1.5.1 HVAC Fresh air unit
 - 1.6.1.1 Ducted systems and terminal units
 - 1.6.1.2 Control devices and system integrations (DDC)
 - 1.6.1.3 General Fan Systems: Exhaust, Cooling Transfer
 - 1.6.1.4 Split AC systems Including LAN unit.
- 1.5.2 Hydronic System
 - 1.6.2.1 Pumps
 - 1.6.2.2 Water Source Heat Pumps and heating coils.
 - 1.6.2.3 Glycol feed
- 1.5.3 Plumbing & Water Using Systems
 - 1.6.3.1 Domestic hot water heating systems
 - 1.6.3.2 Recirculation systems
 - 1.6.3.3 Water closets and urinals
 - 1.6.3.4 Lavatories and sinks
- 1.5.4 BAS and all electronic controls.
- 1.5.5 Electrical equipment
 - 1.6.5.1 Lighting and related controls
- 1.5.6 Process equipment
 - 1.6.6.1 Process equipment is not included in this commissioning scope

1.6 RESPONSIBILITIES OF THE COMMISSIONING TEAM

- 1.6.1 The commissioning team will include the Commissioning Agent, Mechanical and Electrical Consultants, an Owner's Representative, the Owner's facility management staff/building operator, General Contractor, and Subcontractor(s). A brief description of the roles of these various team members is outlined below.
- 1.6.2 Commissioning Agent
 - 1.6.2.1 Compile the Owner's Requirements Document in consultation with the project Owner.
 - 1.6.2.2 Review the Schematic Design submission and report findings to the Owner.
 - 1.6.2.3 Prepare a Commissioning Plan which defines the process which will be used to verify conformance to the contract and Owner's requirements.
 - 1.6.2.4 Review the Contract Documents prior to tender to verify that Commissioning has been adequately specified and the Owner's requirements will be met.
 - 1.6.2.5 Work with the Mechanical Engineer to provide a Commissioning Specification to be included in the Contract Documents.
 - 1.6.2.6 Review all Contractor bid documents for adherence to the Owner's Requirements.
 - 1.6.2.7 Attend all commissioning meetings.
 - 1.6.2.8 Review the commissioning schedules prepared by the Consultants.
 - 1.6.2.9 Compile commissioning forms and construction checklists for each piece of equipment.
 - 1.6.2.10 Observe Functional Performance Testing and system start-up procedures, as performed by the installing Contractor.
 - 1.6.2.11 Review O&M Documentation for completeness.
 - 1.6.2.12 Verify satisfactory completion of Owner training.
 - 1.6.2.13 Submit the final commissioning report and all supporting documents to the Project Owner.
 - 1.6.2.14 Coordinate seasonal testing, as needed.
- 1.7.3 Owner / Owner's Representative / Building Operations Staff
 - 1.7.3.1 The Owner will contract a Commissioning Agent to act as Owner's Representative and Commissioning Agent in all matters pertaining to testing, commissioning, and turn-over procedures.
 - 1.7.3.2 Review design submissions for maintenance requirements which may not meet the Owner's Requirements.
 - 1.7.3.3 Attend training sessions conducted by all contractors and equipment

suppliers in order to build a familiarity with the systems they will need to maintain.

- 1.7.3.4 Commissioning and time spent with the Subcontractors and/or Commissioning staff shall not substitute nor count towards training hours, although observation of the commissioning process and functional performance testing is encouraged.

1.7.4 Project Manager

- 1.7.4.1 Deliver a product which meets the design intent, Owner's Requirements, and time constraints of the project.
- 1.7.4.2 Provide the commissioning schedule for all owner-supplied equipment that is integrated with the mechanical and/or electrical systems of the new facility.
- 1.7.4.3 Ensure the Owner provides the necessary labour and materials to carry out commissioning of owner-supplied equipment within the approved project schedule.
- 1.7.4.4 Review design submissions.
- 1.7.4.5 Witness commissioning tests, as required.
- 1.7.4.6 Coordinate technical requirements of Owner/Building Operator training.

1.7.5 Architectural Consultant

- 1.7.5.1 Coordinate with the Project Owner to provide/consult with the Commissioning Agent in regards to the Owner's Requirements.
- 1.7.5.2 Provide the Commissioning Agent with the Basis of Design.
- 1.7.5.3 Provide the Commissioning Agent with all architectural drawings, addenda and change order notices which may affect systems being commissioned.

1.7.6 Engineering Consultants

- 1.7.6.1 Provide mechanical/electrical component of the Basis of Design.
- 1.7.6.2 Review compliance of commissioning work with the requirements of the contract documents.

1.7.7 Contractors and Subcontractors

- 1.7.7.1 Adhere to commissioning requirements as described in the terms of the contract.
- 1.7.7.2 Supply all labor, equipment, and qualified personnel required to complete all Commissioning Activities.
- 1.7.7.3 Include time in the construction schedule for Commissioning Activities.

- 1.7.7.4 Provide the Commissioning Agent with manufacturer's recommended installation and start-up checklists for equipment and systems prior to the commencement of installation.
- 1.7.7.5 Complete all construction checklists, equipment installation forms, and start-up forms as provided by the manufacturer and provided to Commissioning Agent.
- 1.7.7.6 Allow reasonable notification of start-up schedules to Commissioning Agent.
- 1.7.7.7 Perform Functional Performance Tests in coordination with the Commissioning Agent.
- 1.7.7.8 Make adjustments and corrections and repeat unsuccessful tests to the satisfaction of the Commissioning Agent.
- 1.7.7.9 Sign off completion of Functional Performance Testing when tests are completed to the satisfaction of the Commissioning Agent.
- 1.7.7.10 Provide the completed forms and as-built shop drawings for incorporation into the Commissioning Report.
- 1.7.7.11 Provide system information and trend data to the Commissioning Agent as requested.
- 1.7.7.12 Provide the Commissioning Agent with a staff training plan for review.
- 1.7.7.13 Provide the Owner with staff training as per the training plan.
- 1.7.7.14 Provide appropriate and sufficient documentation for the O&M manual to the Project Manager.
- 1.7.8 Testing, Adjusting and Balancing (TAB) Subcontractor
 - 1.7.8.1 Perform all required tests outlined in the TAB section of the Mechanical Specification under the direction of the General Contractor.
 - 1.7.8.2 Provide completed Balancing Reports to the Commissioning Agent for review.
- 1.7.9 Acronyms: Acronyms used throughout the following text for commissioning team members is as follows:
 - 1.7.9.1 CA – Commissioning Agent
 - 1.7.9.2 PM – Project Manager
 - 1.7.9.3 DPC – Prime Architectural Consultant
 - 1.7.9.4 DM – Mechanical Designer
 - 1.7.9.5 DE – Electrical Designer
 - 1.7.9.6 GC – General Contractor

- 1.7.9.7 MC – Mechanical Contractor
- 1.7.9.8 EC – Electrical Contractor
- 1.7.9.9 TAB – Testing & Balancing Specialist

1.8 COMMISSIONING TEAM MEETINGS

- 1.8.1 Meetings will be scheduled by the PM, in coordination with the CA and GC.
- 1.8.2 Coordination meetings will include members of the commissioning team as required, and will be used to plan, discuss, and review commissioning activities. Meetings shall take place until work has been completed, or as appropriate.
- 1.8.3 The construction schedule, commissioning schedule, and the commissioning plan shall be reviewed and updated as required. Upcoming tests and equipment start-ups will be reviewed and completed test results will be evaluated.
- 1.8.4 The PM will arrange for the minutes of the meetings to be compiled and distributed following each meeting.

1.9 COMMISSIONING DOCUMENTATION

- 1.9.1 The CA will prepare a Schematic Design Report, to be submitted to the Project Owner.
- 1.9.2 The CA will prepare a Construction Document Report.
- 1.9.3 The CA will prepare a Contractor's Submittal Report to review and verify adherence to the Owner's Requirements.
- 1.9.4 The CA will prepare the Commissioning Plan Schedule in relation to the construction schedule, to be approved by the GC. The Commissioning Plan Schedule will be updated monthly.
- 1.9.5 The GC, or applicable sub-trade, shall be responsible for completion of all system verification forms, equipment start-up forms, functional performance test forms and all related witnessed testing. As required, the TAB Contractor will provide information necessary for form completion.
- 1.9.6 The MC will supply single-line schematic Control Drawings and written Sequences of Operation for all commissioned systems/equipment to the CA.
- 1.9.7 The PM shall supply the CA with a full copy of all shop drawings following approval of the GC.
- 1.9.8 Sub-contractors are responsible for the submission of all appropriate manufacturers' data for inclusion in the O&M Manual.
- 1.9.9 Contractors will demonstrate system operation in cooperation with the CA to complete all commissioning work.
- 1.9.10 The CA will submit interim Commissioning Reports/site inspection reports prior to

building acceptance at the discretion of the CA based on the progress of the project and the need to keep the owner informed of significant developments occurring during the project.

- 1.9.11 The final Commissioning Report will be submitted on completion of functional testing and addenda issued after seasonal testing and 10-month warranty review.

1.10 SYSTEM PREPARATION

- 1.10.1 The Contractor will be tasked with effectively preparing all systems for commissioning. Tasks include, but are not limited to ensuring that:
- 1.10.1.1 Shipping stops have been removed.
 - 1.10.1.2 Equipment nameplates are clean and accessible.
 - 1.10.1.3 Factory startups have been completed and submitted to the CA.
 - 1.10.1.4 Initial lubrication of equipment is complete according to Manufacturer's recommendations.
 - 1.10.1.5 Bearings are lubricated as per Manufacturer's recommendations.
 - 1.10.1.6 Drive screws and keyways are tight.
 - 1.10.1.7 Vibration isolators are properly aligned and adjusted. Vibration isolators are in their proper locations and have correctly sized springs.
 - 1.10.1.8 Flex connections are aligned.
 - 1.10.1.9 Equipment is secured in place.
 - 1.10.1.10 V-belt drives are correctly installed and properly aligned.
 - 1.10.1.11 Belts are adjusted and belt guards & safety shields are in place.
 - 1.10.1.12 All systems are properly filled with operating liquid/medium.
 - 1.10.1.13 Pressure and temperature gauges are installed and are reading correctly.
 - 1.10.1.14 All water piping is located in spaces which are heated to prevent freezing.
 - 1.10.1.15 Air filters and strainers are clean.
 - 1.10.1.16 All ductwork is installed, connected and insulated/lined as per the Contract Documents.
 - 1.10.1.17 All roof-mounted equipment is properly flashed as per the Contract Documents.
 - 1.10.1.18 Filters are in place and provide proper seals around edges.
 - 1.10.1.19 Fire dampers are properly installed and linked, and have been checked by the TAB Subcontractor.
 - 1.10.1.20 All test stations and flow devices are installed and are operating properly.

- 1.10.1.21 All equipment is installed properly as per the Contract Documents.
- 1.10.1.22 All rooftop heating and cooling equipment is operating as per Manufacturer's recommendations.
- 1.10.1.23 The DDC system is completely calibrated as per the Sequence of Operations, and is operating in automatic mode with no hardware or software points commanded to a manual value.
- 1.10.1.24 Non-DDC controls such as thermostats, and water source heat pumps are calibrated and are able to control the appropriate equipment as per the Sequence of Operations.
- 1.10.1.25 All hardware and software interlocks are wired and verified.
- 1.10.1.26 All valves, dampers and their operators are properly installed and operating. Dampers close tightly, operate smoothly, and stroke fully.
- 1.10.1.27 Motor rotations for all fans and pumps are correct.
- 1.10.1.28 Voltages and phasing match nameplate data.
- 1.10.1.29 Thermal overloads have been installed as per the Contract Documents.
- 1.10.1.30 Motors are not overloaded.

1.11 INSPECTION REQUIREMENTS

- 1.11.1 Once equipment is running, the contractor shall check that the equipment is operating according to specifications, including:
 - 1.11.1.1 No excessive vibration or noise
 - 1.11.1.2 No loose components
 - 1.11.1.3 All initial control set-points are set as per Specification, or have been adjusted to suit actual conditions
 - 1.11.1.4 Motor amperages are as per Specification
 - 1.11.1.5 Heat build-up in motors, bearings, etc. is within Manufacturer's recommendations
 - 1.11.1.6 Control system components are properly calibrated and system is functioning as per Specification
- 1.11.2 The Contractor will promptly adjust, repair, or correct all items that are found not to be operating according to Specification.
- 1.11.3 All mechanical systems will be observed under actual operating conditions for sufficient time to ensure proper operation under varying conditions.
- 1.11.4 The Contractor shall periodically check the following items and make corrections, adjustments, or repairs, as required:
 - 1.11.4.1 Strainers and filters are in place and are changed as specified

- 1.11.4.2 Control system is functioning as per the Sequence of Operations
- 1.11.4.3 Safety valves and seals are tight and fully operational; there are no system leaks
- 1.11.4.4 All mechanical equipment is operating with pressures and temperatures within Manufacturer's recommendations.
- 1.11.4.5 All gauges are adjusted and reading properly
- 1.11.4.6 Excessive oil and grease is cleaned on a regular basis
- 1.11.4.7 Dampers and valves close tightly and stroke fully

1.12 FUNCTIONAL PERFORMANCE TESTING

- 1.12.1 Functional Performance Tests are to be done to verify the performance of individual systems, as well as the interactions between systems as they operate together.
- 1.12.2 Functional Performance Testing shall begin when all mechanical testing; start-up checklists; and testing, adjusting, and balancing required by the Contractor have been completed, and when the CA has acknowledged that the physical installation of components and systems being tested is substantially installed in accordance with the Contract Documents.
- 1.12.3 The testing schedule will be coordinated by the PM and the Commissioning Team. Adequate notice will be provided to all parties involved in performing & witnessing tests.
- 1.12.4 The CA may use the DDC System or any other instrumentation necessary for mechanical systems testing. The DDC System shall be programmed by the Controls Subcontractor to record trend data over a time period specified by the PM or CA.
- 1.12.5 The CA may use trend data to evaluate the performance of the systems in conjunction with other recorded data.
- 1.12.6 Tests shall be conducted systematically, starting from the primary energy system through to the system components and controls.

PART 2 COMMISSIONING FORM COMPLETION

2.1 GENERAL

- 2.1.1 The appropriate designated sub-contractor shall complete manufacturer installation checklists, manufacturer start-up checklists, and functional performance testing forms for all installed mechanical and electrical equipment within Commissioning scope.
- 2.1.2 System verification shall be completed to verify the static condition of all

system components, while testing shall be used to monitor and optimize system interactions.

- 2.1.3 Completed checklists and forms shall be promptly forwarded to the CA.
- 2.1.4 All forms and tests are completed with the objective of verifying that installed equipment meets the intent of the design, and functional performance meets the design specifications and owner's requirements.
- 2.1.5 Leakage tests are to be completed as construction progresses, according to the Construction Schedule, and witnessed by the PM.

2.2 INSTALLATION CHECKLISTS

- 2.2.1 The related installation subcontractor shall complete installation checklists as provided by the manufacturer or supplier
- 2.2.2 The subcontractor shall provide the CA with all completed and signed forms
- 2.2.3 The CA shall verify installation and sign the completed forms.

2.3 START-UP CHECKLISTS

- 2.3.1 The related installation subcontractor shall complete all start-up checklists as provided by the manufacturer or supplier
- 2.3.2 The sub-contractor shall submit manufacturer's data/product information sheets for each installed component for inclusion in the O&M manual.
- 2.3.3 The CA shall witness system start-up procedures for all equipment within a system, whenever feasible, and will verify that start-up was conducted according to manufacturer's recommendations and the Contract Documents.
- 2.3.4 Contractors will do their best to coordinate start-ups in order to minimize the number of necessary site visits.
- 2.3.5 The subcontractor shall provide the CA with all completed and signed start-up checklists.
- 2.3.6 The TAB subcontractor shall provide information and test results from testing, adjusting, and air balancing, as required.
- 2.3.7 The CA will sign all completed forms.

2.4 FUNCTIONAL PERFORMANCE TEST FORMS

- 2.4.1 The Mechanical Subcontractor shall work in consultation with the CA, PM, and related Subcontractor to complete functional performance testing for all installed equipment and systems.
- 2.4.2 The CA shall provide supplementary forms as required for commissioning equipment.

- 2.4.3 The Subcontractor shall provide test equipment, and demonstrate system operation to the CA as deemed necessary.
- 2.4.4 The CA and PM shall maintain communications with all Subcontractors to witness testing as required.
- 2.4.5 The Mechanical Subcontractor shall report all test failures to the PM and CA.
- 2.4.6 Unsuccessful tests will be repeated until they are successful, at no additional cost to the contract.
- 2.4.7 The CA shall witness all repeated tests as deemed necessary by the CA.
- 2.4.8 The CA shall sign the completed forms.

2.5 SHO DRAWINGS

- 2.5.1 A copy of all approved shop drawings associated with equipment to be commissioned shall be forwarded to the CA after review by the GC, Mechanical Subcontractor, and the PM.
- 2.5.2 The CA shall review the Shop Drawings, and make comments to the PM as necessary

2.6 SYSTEM ACCEPTANCE

- 2.6.1 All test forms shall be completed and signed promptly after testing, and submitted to the CA for review and approval.
- 2.6.2 Prior to final project completion, the CA shall assemble the completed testing forms into a single document.
- 2.6.3 Where equipment does not meet the design intent or Owner's Requirements, the system will be adjusted and re-tested until performance is acceptable.
- 2.6.4 Where necessary, the PM shall issue corrective measures if acceptable performance is not achieved.
- 2.6.5 The CA shall review the results of the Functional Performance Tests and shall submit a report on the findings to the PM. This report shall make recommendations for improving system performance whenever possible.
- 2.6.5 Interim Acceptance Certificate for substantial completion when:
 - 2.6.5.1 Completed Cx documentation has been received, reviewed for suitability and approved by Consultant / CA.
 - 2.6.5.2 Equipment, components, systems and integrated systems have been fully commissioned and functional as per design intent within the context of the Owner Requirement.
 - 2.6.5.3 Final O&M and Training Manual received, reviewed and approved by Departmental Representative for suitability.
 - 2.6.5.4 Successful completion of integrated system tests, life safety support

- systems tests and after meeting all requirements of the authority having jurisdiction.
- 2.6.5.5 Completion of Training session to all Operational and Maintenance staffs.

PART 3 SEASONAL/DEFERRED COMMISSIONING

3.1 GENERAL

- 3.1.1 A schedule for the deferred commissioning will be drawn up at the time of construction completion which will identify all performance testing which could not be undertaken due to season, lack of occupancy, or for any other reason.
- 3.1.2 All seasonally deferred testing will be completed at the discretion of the CA, and will be coordinated with the Project Owner.
- 3.1.3 The CA will arrange with the Project Owner to prepare a schedule for seasonal commissioning which allows the systems to be tested under varying operating conditions, including extreme heat and cold.
- 3.1.4 Seasonal and other deferred Commissioning must be completed within 12 months of building acceptance.
- 3.1.5 A report on the results of all deferred commissioning shall be submitted to the Project Owner.
- 3.1.6 Any problems which are uncovered during testing shall be reported to the Project Owner, including suggestions for corrective actions to be taken to resolve the problem.

3.2 PROCEDURES

- 3.2.1 Following System Acceptance, a list of deferred commissioning items will be identified. Reason for deferral, including seasonal limitations, or lack of occupancy, shall be recorded, and a schedule for completing each task shall be drawn up.
- 3.2.2 Seasonal performance tests will include the demonstration of the following, depending on season:
 - 3.2.2.1 Start-up/shutdown
 - 3.2.2.2 Occupied/unoccupied modes
 - 3.2.2.3 Modulation of device range or capacity
 - 3.2.2.4 Power failure
 - 3.2.2.5 Alarms
 - 3.2.2.6 Equipment staging
 - 3.2.2.7 Interlocks with other equipment

- 3.2.2.8 Sensor and actuator calibrations
- 3.2.3 Functional Performance Testing Procedures identified in section 1.10 shall be followed for all deferred commissioning.
- 3.2.4 Deferred commissioning activities will be conducted by the related Subcontractor in the presence of the CA and with the assistance of the building operating personnel and/or the Project Owner.

PART 4 OPERATIONS & MAINTENANCE MANUALS

4.1 O&M DOCUMENTATION

- 4.1.1 The project team, contractors, and subcontractors shall coordinate to supply the CA with equipment documentation and product data for inclusion in the O&M submissions.
- 4.1.2 The CA will review the O&M manual that:
 - 4.1.2.1 Information is complete and applicable
 - 4.1.2.2 The O&M document is bound and labeled as per the Mechanical Specification
 - 4.1.2.3 Instructions for installation, maintenance, replacement, and start-up instructions are included
 - 4.1.2.4 A list of replacement parts, special tools required, and local sources is included
 - 4.1.2.5 Warranty information is identified
 - 4.1.2.6 As-built controls package for all sequences and modes of operation are included
 - 4.1.2.7 A description of each sequence of operation has been written
 - 4.1.2.8 Single-line schematic control drawings have been included
 - 4.1.2.9 As-built drawings are submitted in AutoCad format.

PART 5 TRAINING AND ORIENTATION

5.1 BUILDING OPERATOR'S TRAINING

- 5.1.1 Staff training shall be provided by the appropriate Contractor under the supervision of the GC, as per the Mechanical specification.
- 5.1.2 Training will continue until the Project Owner is satisfied that adequate training has been provided.

5.1.3 Training sessions may be videotaped for future reference.

5.1.4 Training sessions will fulfill the following requirements:

- 5.1.4.1 Identification of the general purpose of system (design intent)
- 5.1.4.2 Instruction on how to use the O&M Manuals
- 5.1.4.3 Review of as-built control drawings and schematics
- 5.1.4.4 Start-up, normal operation, shut-down, unoccupied operation, seasonal changeover, manual operation, control setup and programming troubleshooting and alarms
- 5.1.4.5 Demonstration of interactions between systems, and optimized methods for energy conservation
- 5.1.4.6 Identification of health and safety issues
- 5.1.4.7 Special maintenance and replacement sources
- 5.1.4.8 Occupant interaction issues
- 5.1.4.9 System response to different operating conditions

END SECTION

Part 1 General

1.1 ACTION AND INFORMATIONAL SUBMITTALS

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

1.2 SITE CONDITIONS

- .1 If material resembling spray or trowel-applied asbestos or other designated substance listed as hazardous be encountered, stop work, take preventative measures, and notify Consultant immediately.
 - .1 Proceed only after receipt of written instructions have been received from Consultant.
- .2 Notify Consultant before disrupting building access or services.

Part 2 Execution

2.1 EXAMINATION

- .1 Inspect site with Consultant and verify extent and location of items designated for removal, disposal, alternative disposal, recycling, salvage and items to remain.
- .2 Locate and protect utilities. Preserve active utilities traversing site in operating condition.
- .3 Notify and obtain approval of utility companies before starting demolition.
- .4 Disconnect, cap, plug or divert, as required, existing public utilities within the property where they interfere with the execution of the work, in conformity with the requirements of the authorities having jurisdiction. Mark the location of these and previously capped or plugged services on the site and indicate location (horizontal and vertical) on the record drawings. Support, shore up and maintain pipes and conduits encountered.
 - .1 Immediately notify Consultant and utility company concerned in case of damage to any utility or service, designated to remain in place.
 - .2 Immediately notify the Consultant should uncharted utility or service be encountered, and await instruction in writing regarding remedial action.

2.2 PREPARATION

- .1 Protection of In-Place Conditions:
 - .1 Keep noise, dust, and inconvenience to occupants to minimum.
 - .2 Protect building systems, services and equipment.
 - .3 Provide temporary dust screens, covers, railings, supports and other protection as required.
- .2 Demolition/Removal:

- .1 Remove items as indicated.
- .3 Protection:
 - .1 Do work in accordance with Section 01 35 29 – Health and Safety Requirement.

2.3 CLEANING

- .1 Progress Cleaning: clean in accordance with Section 01 74 11 – Cleaning.
 - .1 Leave Work area clean at end of each day.
- .2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 74 11 - Cleaning.
- .3 Refer to demolition drawings and specifications for items to be salvaged for reuse.
- .4 Waste Management: separate waste materials for reuse in accordance with Section 01 74 21 - Construction/Demolition Waste Management and Disposal.
 - .1 Remove recycling containers and bins from site and dispose of materials at appropriate facility.

END OF SECTION

Part 1 General

1.1 REFERENCES

- .1 Definitions:
 - .1 Dangerous Goods: product, substance, or organism specifically listed or meets hazard criteria established in Transportation of Dangerous Goods Regulations.
 - .2 Hazardous Material: product, substance, or organism used for its original purpose; and is either dangerous goods or material that will cause adverse impact to environment or adversely affect health of persons, animals, or plant life when released into the environment.
 - .3 Hazardous Waste: hazardous material no longer used for its original purpose and that is intended for recycling, treatment or disposal.
- .2 Reference Standards:
 - .1 Canadian Environmental Protection Act, 1999 (CEPA 1999)
 - .1 Export and Import of Hazardous Waste and Hazardous Recyclable Material Regulations (SOR/2005-149).
 - .2 Health Canada / Workplace Hazardous Materials Information System (WHMIS)
 - .1 Material Safety Data Sheets (MSDS).
 - .3 National Research Council Canada Institute for Research in Construction (NRC-IRC)
 - .1 National Fire Code of Canada - 2015.
- .3 South Coast Air Quality Management District (SCAQMD), California State, Regulation XI. Source Specific Standards
 - .1 SCAQMD Rule 1113, Architectural Coatings.
 - .2 SCAQMD Rule 1168, Adhesive and Sealant Applications.

1.2 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Submit in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Product Data:
 - .1 Submit manufacturer's instructions, printed product literature and data sheets for hazardous materials and include product characteristics, performance criteria, physical size, finish and limitations.
 - .2 Submit two copies of WHMIS MSDS in accordance with Section 01 35 29.06 - Health and Safety Requirements to Consultant for each hazardous material required prior to bringing hazardous material on site.
 - .3 Submit hazardous materials management plan to Consultant that identifies hazardous materials, usage, location, personal protective equipment requirements, and disposal arrangements.

1.3 DELIVERY, STORAGE & HANDLING

- .1 Deliver, store and handle materials in accordance with manufacturer's written instructions.
- .2 Delivery and Acceptance Requirements: deliver materials to site in original factory packaging, labelled with manufacturer's name and address.
- .3 Transport hazardous materials and wastes in accordance with Transportation of Dangerous Goods Act, Transportation of Dangerous Goods Regulations, and applicable provincial regulations.
 - .1 When exporting hazardous waste to another country, ensure compliance with Export and Import of Hazardous Waste and Hazardous Recyclable Materials Regulations.
- .4 Storage and Handling Requirements:
 - .1 Co-ordinate storage of hazardous materials with Consultant and abide by internal requirements for labelling and storage of materials and wastes.
 - .2 Store and handle hazardous materials and wastes in accordance with applicable federal and provincial laws, regulations, codes, and guidelines.
 - .3 Store and handle flammable and combustible materials in accordance with National Fire Code of Canada requirements.
 - .4 Keep no more than 45 litres of flammable and combustible liquids such as gasoline, kerosene and naphtha for ready use.
 - .1 Store flammable and combustible liquids in approved safety cans bearing the Underwriters' Laboratory of Canada or Factory Mutual seal of approval.
 - .2 Storage of quantities of flammable and combustible liquids exceeding 45 litres for work purposes requires the written approval of the Consultant.
 - .5 Transfer of flammable and combustible liquids is prohibited within buildings.
 - .6 Transfer flammable and combustible liquids away from open flames or heat-producing devices.
 - .7 Solvents or cleaning agents must be non-flammable or have flash point above 38 degrees C.
 - .8 Store flammable and combustible waste liquids for disposal in approved containers located in safe, ventilated area. Keep quantities to minimum.
 - .9 Observe smoking regulations, smoking is prohibited in areas where hazardous materials are stored, used, or handled.
 - .10 Storage requirements for quantities of hazardous materials and wastes in excess of 5 kg for solids, and 5 litres for liquids:
 - .1 Store hazardous materials and wastes in closed and sealed containers.

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- .2 Label containers of hazardous materials and wastes in accordance with WHMIS.
 - .3 Store hazardous materials and wastes in containers compatible with that material or waste.
 - .4 Segregate incompatible materials and wastes.
 - .5 Ensure that different hazardous materials or hazardous wastes are stored in separate containers.
 - .6 Store hazardous materials and wastes in secure storage area with controlled access.
 - .7 Maintain clear egress from storage area.
 - .8 Store hazardous materials and wastes in location that will prevent them from spilling into environment.
 - .9 Have appropriate emergency spill response equipment available near storage area, including personal protective equipment.
 - .10 Maintain inventory of hazardous materials and wastes, including product name, quantity, and date when storage began.
 - .11 When hazardous waste is generated on site:
 - .1 Co-ordinate transportation and disposal with Consultant.
 - .2 Comply with applicable federal, provincial and municipal laws and regulations for generators of hazardous waste.
 - .3 Use licensed carrier authorized by provincial authorities to accept subject material.
 - .4 Before shipping material obtain written notice from intended hazardous waste treatment or disposal facility it will accept material and it is licensed to accept this material.
 - .5 Label containers with legible, visible safety marks as prescribed by federal and provincial regulations.
 - .6 Only trained personnel handle, offer for transport, or transport dangerous goods.
 - .7 Provide photocopy of shipping documents and waste manifests to Consultant.
 - .8 Track receipt of completed manifest from consignee after shipping dangerous goods. Provide photocopy of completed manifest to Consultant. Report discharge, emission, or escape of hazardous materials immediately to Consultant and appropriate provincial authority. Take reasonable measures to control release.

- .12 Ensure personnel have been trained in accordance with Workplace Hazardous Materials Information System (WHMIS) requirements.
- .13 Report spills or accidents immediately to Consultant. Submit a written spill report to Consultant within 24 hours of incident.
- .5 Packaging Waste Management: remove for reuse as specified in Construction Waste Management Plan in accordance with Section 01 74 21 - Construction/Demolition Waste Management and Disposal.

Part 2 Products

2.1 MATERIALS

- .1 Description:
 - .1 Bring on site only quantities hazardous material required to perform Work.
 - .2 Maintain MSDS in proximity to where materials are being used. Communicate this location to personnel who may have contact with hazardous materials.

Part 3 Execution

3.1 CLEANING

- .1 Progress Cleaning: clean in accordance with Section 01 74 11 - Cleaning.
 - .1 Leave Work area clean at end of each day.
- .2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 74 11 - Cleaning.
- .3 Waste Management: separate waste materials for recycling in accordance with Section 01 74 21 - Construction/Demolition Waste Management and Disposal.
 - .1 Dispose of hazardous waste materials in accordance with applicable federal and provincial acts, regulations, and guidelines.
 - .2 Recycle hazardous wastes for which there is approved, cost effective recycling process available.
 - .3 Send hazardous wastes to authorized hazardous waste disposal or treatment facilities.
 - .4 Burning, diluting, or mixing hazardous wastes for purpose of disposal is prohibited.
 - .5 Disposal of hazardous materials in waterways, storm or sanitary sewers, or in municipal solid waste landfills is prohibited.
 - .6 Dispose of hazardous wastes in timely fashion in accordance with applicable provincial regulations.
 - .7 Minimize generation of hazardous waste to maximum extent practicable. Take necessary precautions to avoid mixing clean and contaminated wastes.

- .8 Identify and evaluate recycling and reclamation options as alternatives to land disposal, such as:
 - .1 Hazardous wastes recycled in manner constituting disposal.
 - .2 Hazardous waste burned for energy recovery.
 - .3 Lead-acid battery recycling.
 - .4 Hazardous wastes with economically recoverable precious metals.

END OF SECTION

PART 1 GENERAL

1.1 General and Related Work

- .1 Read this section in conjunction with all other sections so as to comply with the requirements of Division 1 and the General Conditions of the Contract.
- .2 The site conditions identify the location and condition of all known asbestos-containing materials (ACM) to be disturbed by the work of this section. The specification fulfils the requirements of the report required by Manitoba Regulation 217-2006.
- .3 Unless otherwise shown or specified it is the intent that work performed as per this section will result in the removal and disposal or decontamination of all ACM and all materials which have been contaminated by ACM either during or prior to work of this section.

1.2 Site Conditions

- .1 Red/Brown mastic, containing chrysotile asbestos, is present on uninsulated ducting throughout the 7th floor.
- .2 Black tar mastic, containing chrysotile asbestos, is present on foil face jacketing on ductwork throughout the 7th floor.

1.3 Outline of Work

- .1 Use Type 1 procedures to remove and dispose of the following:
 - .1 Red/Brown mastic present on uninsulated ducting scheduled for removal/
 - .2 Black mastic present on foil face jacketing of duct insulation scheduled for removal.

1.4 Definitions

- .1 Asbestos: Any of the fibrous silicates defined including: actinolite, amosite, anthophyllite, chrysotile, crocidolite and tremolite.
- .2 Asbestos Abatement Consultant: Owner's Representative providing inspection and air monitoring.
- .3 Asbestos Abatement Contractor: Contractor or sub-contractor performing work of this section.
- .4 Asbestos-Containing Material(s) (ACM): Material(s) identified under Site Conditions including debris, fallen material and settled dust.
- .5 Asbestos Work Area: Area where work takes place which will, or may, disturb ACM.
- .6 Authorized Visitors: Prime Contractor, Building Owner or Representatives, Asbestos Abatement Consultant, and persons representing regulatory agencies.
- .7 Competent Worker: A worker who is qualified because of knowledge, training and experience to perform the work, is familiar with Regulation 217-2006 and the Occupational Health and Safety Act, and has knowledge of the potential or actual danger to health and safety in the work.

- .8 Friable Material: means a material when dry can be crumbled, pulverized or powdered by hand pressure or is crumbled, pulverized or powdered.
- .9 HEPA Filter: High Efficiency Particulate Arresting filter that is at least 99.97 percent efficient in collecting a 0.3 micrometre aerosol.
- .10 PCM: Phase Contrast Microscopy.
- .11 Polyethylene: Either polyethylene sheeting or rip-proof polyethylene sheeting (as specified) with tape along edges, around penetrating objects, over cuts and tears, and elsewhere as required to provide a continuous polyethylene membrane to protect underlying surfaces from damage, and to prevent escape of asbestos fibres through sheeting into Occupied Areas.
- .12 Occupied Area: Any area of the building outside the Asbestos Work Area.
- .13 Personnel: All contractor's employees, sub-contractor's employees, supervisors.
- .14 Remove: Remove means remove and dispose of (as applicable type of waste) unless followed by other instruction (e.g. remove and turn over to Owner).
- .15 TEM: Transmission Electron Microscopy.

1.5 Submittals

- .1 Submit prior to starting work:
 - .1 Workplace Safety and Insurance Board Clearance Certificate.
 - .2 Insurance certificates.
 - .3 Copy of Company Health and Safety Policy and applicable Programs.
 - .4 Copy of Certificate of Approval for transportation of asbestos waste and location of landfill.
- .2 Submit the following information regarding personnel prior to starting work:
 - .1 Resumes of the supervisory personnel.
 - .2 Proof in the form of a certificate that supervisory personnel have attended a training course on asbestos removal (3 day minimum duration).
 - .3 WHMIS training certificates for all personnel.
 - .4 Written statement that personnel have had instruction on hazards of asbestos exposure, the use of respirator, protective clothing, worker and waste decontamination procedures, and all aspects of work procedures and protective measures.
 - .5 Certificate proving that each worker on site has been fit tested for the respirator appropriate for the work being performed.
- .3 Submit performance data on HEPA filtered vacuums including HEPA challenge integrity leak tests no more than 3 months old prior to isolating the work area or commencing asbestos abatement.

- .4 Submit the following prior to isolating the work area:
 - .1 Written statement that the Ground Fault Interrupter Panels use CSA approved parts and have been inspected by the Electrical Safety Authority.
 - .2 Material Safety Data Sheets for chemicals or material used in the course of the Asbestos Abatement Project.
- .5 Submit the following upon completion of the work.
 - .1 Manifests, waybills, bills of lading etc. as applicable for each type of waste.

1.6 Regulations

- .1 Comply with Federal, provincial, and local requirements, provided that in any case of conflict among those requirements or with these Specifications the more stringent requirements shall apply. Work shall be performed under regulations in effect at the time work is performed.

1.7 Supervision

- .1 Provide on-site, a supervisor, with authority to oversee all aspects of the work, including but not limited to, health and safety, methods, scheduling, labour and equipment requirements.
- .2 The supervisor must be on site at all times during work at risk of disturbing ACM. Failure to comply with this requirement may result in a stoppage of work, at no cost to the Owner.
- .3 Provide a minimum of one supervisor for every 10 workers.
- .4 Replace supervisory personnel, with approved replacements, within 3 working days of a written request from the Asbestos Abatement Consultant. Asbestos Abatement Consultant reserves the right to request replacement of supervisory personnel without explanation.
- .5 Do not replace supervisory personnel without written approval from the Asbestos Abatement Consultant.

1.8 Quality Assurance

- .1 Ensure the removal and handling of ACM or asbestos contaminated materials is performed by persons experienced in the methods, procedures and industry practices of asbestos abatement.
- .2 Complete work so that at no time airborne asbestos, visible solid residue, or water runoff contaminates areas outside Asbestos Work Area. Asbestos Abatement Consultant is empowered to order a shutdown of work when a leak has occurred or is likely to occur. Cost of additional work by Asbestos Abatement Contractor and/or Asbestos Abatement Consultant to rectify unsatisfactory conditions shall be charged to the Asbestos Abatement Contractor.
- .3 Perform all work involving other trades such as electrical, mechanical, carpentry, glazing etc. using licensed persons experienced and qualified for the work required.

- .4 The Asbestos Abatement Consultant will not be responsible for and will not have control or charge of construction means, methods, techniques, sequences or procedures, or for safety precautions and programs required for the Work in accordance with the applicable construction safety legislation, other regulations or general construction practice. The Asbestos Abatement Consultant will not be responsible for or have control or charge over the acts or omissions of the Asbestos Abatement Contractor, his Subcontractors or their agents, employees or other persons performing any of the Work.

1.9 Notification

- .1 Notify Sanitary Landfill site as per local requirements.
- .2 Inform all sub trades of the presence of ACM identified in the contract documents.
- .3 Notify the Owner or Owners Representative, if friable materials not identified in the contract documents are discovered during the course of the work. Stop work in these areas immediately.

1.10 Insurance

- .1 Maintain a Commercial General Liability Policy with an insurance company acceptable to Pinchin Ltd. and THE OWNER. The intent of this policy is to hold Pinchin Ltd. and THE OWNER harmless as it relates to claims for Bodily Injury or Property Damage or both, relating to the contract. Commercial General Liability insurance shall be provided on an “occurrence” basis to cover injury or damage (whether detected or not during the policy period) which happens during the policy period.
- .2 Maintain an Automobile or Fleet Policy, and Non-owned Automobile Policy with an insurance company acceptable to Pinchin Ltd. and THE OWNER. The intent of these policies is to hold Pinchin Ltd. and THE OWNER harmless as it relates to claims for Bodily Injury or Property Damage or both, relating to the contract.
- .3 Maintain a Pollution Liability Policy (or asbestos liability policy or specific coverage under the CGL for asbestos abatement) with an insurance company acceptable to Pinchin Ltd. and THE OWNER. The intent of this policy is to hold Pinchin Ltd. and THE OWNER harmless as it relates to claims for Bodily Injury or Property Damage or both, relating to the contract. Pollution Liability shall be provided on an “occurrence” basis to cover injury or damage (whether detected or not during the policy period) which happens during the policy period. Without limiting the generality of the foregoing, the policy shall insure the operations of asbestos abatement and shall not contain any environmental and/or health hazard exclusions relating to remediation operations including asbestos abatement.
- .4 Forward all certificates to Pinchin Ltd. and THE OWNER before work is commenced, showing Pinchin Environmental Ltd and THE OWNER as additional insured as their interest may appear.
- .5 THE OWNER may request a certified true copy of the policies.

- .6 The limits will not be less than:
 - .1 Commercial General Liability \$5,000,000.00
 - .2 Automobile \$2,000,000.00
 - .3 Pollution Policy (Asbestos Liability) \$5,000,000.00

1.11 Instruction and Training

- .1 Provide instruction and training to all workers including the following:
 - .1 Hazards of asbestos.
 - .2 Use, care and disposal of protective equipment (including but not limited to respirators and filters) and clothing that would be used and worn during abatement work, including:
 - .1 Limitations of equipment.
 - .2 Inspection and maintenance of equipment.
 - .3 Proper fitting of equipment.
 - .4 Disinfecting and cleaning of equipment.
 - .3 Personal hygiene to be observed when performing the work.
 - .4 The measures and procedures prescribed by this section.
- .2 Instruction and training must be provided by a competent person.

1.12 Personal Protection

- .1 Provide non-powered half-face respirators with P100 high efficiency (HEPA) cartridge filters when requested by personnel.
- .2 Respirators shall be:
 - .1 Certified by the National Institute of Occupational Safety and Health (NIOSH).
 - .2 Fitted so that there is an effective seal between the respirator and the worker's face. Ensure that no person required to enter an Asbestos Work Area has facial hair which affects the seal between respirator and face.
 - .3 Assigned to a worker for their exclusive use.
 - .4 Maintained in accordance with manufacturer's specifications.
 - .5 Cleaned, disinfected and inspected by a competent person after use on each shift, or more often if required.
 - .6 Repaired or have damaged or deteriorated parts replaced.
 - .7 Stored in a clean and sanitary location.
 - .8 Provided with new filters as necessary, according to manufacturer's instructions.
- .3 Personnel must have respirators fit checked by qualitative or quantitative fit-testing. Instruction must be provided by a competent person as defined by the Occupational Health and Safety Act.
 - .1 Personnel shall wear and use the respirator provided.

- .4 As per the requirements of Regulation 217-2006, when requested by personnel, provide protective clothing which:
 - .1 Is made of a material that does not readily retain nor permit penetration of asbestos fibres.
 - .2 Consists of head covering and full body covering that fits snugly at the ankles, wrists and neck.
 - .3 Is replaced or repaired if torn or ripped.
- .5 Decontaminate clothing or protective clothing by using a HEPA Vacuum, or by damp wiping prior to leaving the Asbestos Work Area:
 - .1 Dispose of as ACM.
- .6 Provide soap, towels and facilities for washing of hands and face, which shall be used by all personnel when leaving the Asbestos Work Area.
- .7 Prohibit smoking, eating, drinking, chewing in the Asbestos Work Area.
- .8 Use hard hats, safety shoes and other personal protective equipment required by applicable construction safety regulations.

1.13 Authorized Visitor Protection

- .1 Provide clean protective clothing and equipment, and approved respirators to Authorized
- .2 Ensure Authorized Visitors have received required training prior to granting entry into Asbestos Work Area.

PART 2 PRODUCTS AND FACILITIES

2.1 Materials and Equipment

- .1 All materials and equipment brought to work site must be in good condition and free of asbestos, asbestos debris, and fibrous materials.
- .2 Airless Sprayer: AC powered pressure washer that allows wetting agent to mix with water, uses no air or compressed air, and has a nozzle to regulate power and pressure.
- .3 Amended Water: Water with wetting agent added for purpose of reducing surface tension to allow thorough wetting of ACM.
- .4 Asbestos Waste Container: An impermeable container acceptable to disposal site comprised of one of the following:
 - .1 A 6 mil (0.15 mm) labelled yellow sealed polyethylene bag, inside a second clear 6 mil (0.15 mm) sealed polyethylene bag.
 - .2 A 6 mil (0.15 mm) sealed polyethylene bag, positioned inside or outside a rigid sealed container of sufficient strength to prevent perforation of the container during filling, transportation and disposal.
 - .3 Labelled containers as required by local regulations.

- .5 HEPA Vacuum: High Efficiency Particulate Arresting (HEPA) filtered vacuum equipment with a filter system capable of collecting and retaining spherical particles greater than 0.3 microns at 99.97% efficiency.
- .6 Hose: Leak-proof, minimum bursting strength of 500 PSI or greater if required, abrasion resistant covering, reinforcing, and machined-brass couplings. Maintained and tested. Hose to be temperature resistant if it is to carry domestic hot water.
- .7 Polyethylene Sheeting: 6 mil (0.15 mm) minimum thickness unless otherwise specified in sheet size to minimize joints. New materials only.
- .8 Post Removal Sealant (or Lockdown): Sealant that when applied to surfaces serves the function of trapping residual asbestos fibres or other dust. Product must have flame spread and smoke development ratings both less than 50. Product shall leave no stain when dry. Post Removal Sealant shall be compatible with replacement insulation or fireproofing where required and capable of withstanding service temperature of substrate. Apply to manufacturer's instructions.
- .9 Protective Clothing: Disposable full body coveralls complete with hoods manufactured of a material which does not permit penetration of asbestos fibres. Coveralls to fit snugly at ankles, wrists and neck. Acceptable materials: Dupont Tyvek or Kimberly Clark Kleenguard.
- .10 Rip-Proof Polyethylene Sheeting: Minimum requirements 8 mil (0.20 mm) fabric made up from 5 mil (0.13 mm) weave and 2 layers of 1.5 mil (0.05 mm) poly laminate or approved equal. In sheet size to minimize on-site seams and overlaps. New materials only.
- .11 Sprayer: Garden type portable manual sprayer or water hose with spray attachment if suitable.
- .12 Tape: Duct tape or tape suitable for sealing polyethylene to surfaces under both dry and wet conditions in the presence of Amended Water.
- .13 Wetting Agent: Non-sudsing surfactant added to water to reduce surface tension and increase wetting ability.

2.2 Signage

- .1 Work Area Signs: Post signs in both official languages at access points to the Asbestos Work Area and on hoarding walls as follows:
 - .1 CAUTION.
 - .2 Asbestos Dust Hazard Area.
 - .3 Unauthorized Entry Prohibited.
 - .4 Wear Assigned Protective Equipment.
 - .5 Breathing Asbestos Dust May Cause Serious Bodily Harm.

- .2 Vehicles, Bins and Asbestos Waste Containers: Post signs on both sides of every vehicle used for the transportation of asbestos waste and on every asbestos waste container. Signs must display thereon in large, easily legible letters that contrast in colour with the background the word “CAUTION” in letters not less than ten centimetres in height and the words:
 - .1 CONTAINS ASBESTOS FIBRES.
 - .2 Avoid Creating Dust and Spillage.
 - .3 Asbestos May Be Harmful To Your Health.
 - .4 Wear Approved Protective Equipment.
- .3 Place placards in accordance with Transportation of Dangerous Goods Act.

PART 3 EXECUTION

3.1 Site Preparation

- .1 Moving of equipment, tools, supplies, and stored materials that can be performed without disturbing ACM will be performed by others.
- .2 Remove visible dust and friable material from all surfaces in the work area including those to be worked on, using HEPA Vacuums or wet wiping.
- .3 Install polyethylene drop sheets below areas of work.
- .4 Install polyethylene sheeting on openings in walls and floors (as required) and seal.
- .5 Install signage in clearly visible locations and in sufficient numbers to adequately warn of an asbestos dust hazard.
- .6 Shut down HVAC systems serving the Asbestos Work Area.
 - .1 Install polyethylene sheeting over openings in ducts and diffusers and seal.
 - .2 HVAC to remaining areas of building must not be disrupted during work of this section.
 - .3 System shall remain inoperative until completion of work, unless ducts can be effectively capped.
 - .4 Perform work at scheduled times after shutting down HVAC systems affecting the Asbestos Work Area.
- .7 Provide amended water for wetting ACM, and adequate method of wetting (garden sprayers, airless sprayers, etc).

3.2 Maintenance of Asbestos Work Area

- .1 Inspect polyethylene sheeting and ensure it is effectively sealed and taped. Repair damage and remedy defects immediately.
- .2 Maintain Asbestos Work Area in tidy condition.
- .3 Remove any standing water on polyethylene/floor at the end of every shift.
- .4 Turn off water supply to any hoses and reduce pressure in hose, prior to leaving the Asbestos Work Area at end of shift.

3.3 Asbestos Removal - General

- .1 Do not use powered tools or non-hand held tools.
- .2 Do not use compressed air to clean or remove dust or debris.
- .3 Do not break, cut, drill, abrade, grind, sand or vibrate ACM if it cannot be wetted. Type 2 procedures would be required if the material cannot be wetted due to hazard or
- .4 Wet ACM prior to work and keep ACM wet throughout the removal process.
- .5 Frequently and at regular intervals during the work, clean up dust and waste using HEPA vacuums and/or wet sweeping or mopping.
- .6 Frequently and at regular intervals, place all waste in asbestos waste containers.
- .7 Immediately upon completion of work, clean area with HEPA vacuum and/or wet sweeping or mopping.

3.4 Asbestos Removal - Removal of Other Non-Friable Asbestos Materials

- .1 Wet all material to be disturbed.
- .2 Undo fasteners if necessary to remove material.
- .3 Break material only if unavoidable, and wet material if broken during work.
- .4 Use only non-powered hand-held tools to remove ACM.
- .5 Scrape to remove material adhered to substrate.
- .6 Place removed ACM directly into an asbestos waste container.

3.5 Waste and Material Handling

- .1 Waste bins must be placed on grade or in receiving.
- .2 All bins must be locked and covered when waste transfer is not being performed.
- .3 Ensure redundant non-ACM, rubble, debris, etc. removed during contaminated work are treated, packaged, transported and disposed of as asbestos waste.
- .4 Clean and wash equipment prior to removal from Asbestos Work Area if removed prior to completion.
- .5 Place all equipment, tools and unused materials that cannot be cleaned in Asbestos Waste
- .6 As work progresses, and at regular intervals, transport the sealed and labelled asbestos waste containers from the Asbestos Work Area to waste bin.
- .7 Place items in bins according to waste classification. Place asbestos waste, metals, non-asbestos waste, etc. in separate bins.

- .8 Removal of waste containers and decontaminated tools and materials from the Asbestos Work Area shall be performed as follows:
 - .1 Remove any visible contamination from the surface of the non-porous or sealable item being removed from the Asbestos Work Area. If the item can be cleaned, remove it from the site. If it cannot be cleaned thoroughly, place it in an
 - .2 Place waste or item in Asbestos Waste Container and seal closed.
 - .3 Wet wipe outside of Asbestos Waste Container.
 - .4 At entrance to Asbestos Work Area, place in second Asbestos Waste Container. Seal closed.
 - .5 Remove the item from the Asbestos Work Area.
- .9 Transport waste and materials via the predetermined routes and exits. Arrange waste transfer route with Owner. Use a closed, covered cart to transport through Occupied Areas.
- .10 Provide workers transporting waste with means to access full personal protective equipment and all tools required to properly clean up spilled ACM in the case of a rupture of an Asbestos Waste Container.
- .11 Pick-up and drop off of garbage bin shall be at pre-approved times, and must not interfere with the Owners operations.
- .12 Transport asbestos contaminated waste to local landfill.

3.6 Application of Post Removal Sealant

- .1 Obtain Asbestos Abatement Consultant's written permission to proceed.
- .2 Apply one coat of Post Removal Sealant with an airless sprayer, in accordance with Manufacturer's Instructions, to cover all surfaces on all items in the Asbestos Work Area, including but not limited to polyethylene, ACM substrate, structural steel, and surfaces scheduled for demolition.
- .3 Do not apply post removal sealant to materials that will be damaged by it.

3.7 Asbestos Work Area Dismantling

- .1 Wash or HEPA vacuum equipment used in Asbestos Work Area, seal vacuum hoses and fittings.
- .2 Place tools and equipment used in contaminated work site but not cleaned in 6 mil polyethylene bags prior to removal from Asbestos Work Area.
- .3 Clean polyethylene sheeting and drop sheets which with HEPA vacuum or wet cleaning methods at completion of work.
- .4 Wet drop sheets and polyethylene sheeting.
- .5 Carefully roll polyethylene sheeting on floors or drop sheets toward the centre of enclosure. As polyethylene is rolled away, immediately remove visible debris beneath with a HEPA vacuum.
- .6 Remove remaining polyethylene sheeting.

- .7 Remove seals, tape, signage, etc.
- .8 Seal openings in HEPA vacuums.
- .9 Place polyethylene sheeting, drop sheets, seals, tape, clothing and other contaminated waste in asbestos waste containers, wet wipe and place in second asbestos waste container.
- .10 Rigid portable enclosures and rigid barriers that are to be reused shall be cleaned thoroughly.

3.8 Re-Establishment of Items

- .1 Upon completion of work:
 - .1 Clean, mop and vacuum Asbestos Work Area.
 - .2 Enable building air handling systems.

END OF SECTION

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Part 1 General

1.1 REFERENCES

- .1 CSA Group
 - .1 CSA B111-1974(R2003), Wire Nails, Spikes and Staples.
 - .2 CSA B149 PACKAGE-10, Consists of B149.1, Natural Gas and Propane Installation Code and B149.2, Propane Storage and Handling Code.
- .2 Underwriters Laboratories of Canada (ULC)
 - .1 CAN/ULC-S604-2012, Standard for Factory-Built Type A Chimneys.
 - .2 CAN/ULC-S702.1, Standard for Mineral Fibre Insulation for Buildings.

1.2 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Submit in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Product Data:
 - .1 Submit manufacturer's instructions, printed product literature and data sheets for blanket insulation and include product characteristics, performance criteria, physical size, finish and limitations.
- .3 Certificates:
 - .1 Submit product certificates signed by manufacturer certifying materials comply with specified performance characteristics and criteria and physical requirements.
- .4 Test Reports:
 - .1 Submit certified test reports showing compliance with specified performance characteristics and physical properties.

1.3 DELIVERY, STORAGE AND HANDLING

- .1 Deliver, store and handle materials in accordance with Section 01 61 00 – Common Product Requirements.
- .2 Delivery and Acceptance Requirements: deliver materials to site in original factory packaging, labelled with manufacturer's name and address.
- .3 Storage and Handling Requirements:
 - .1 Store materials off ground indoors in dry location and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.
 - .2 Store and protect specified materials from nicks, scratches, and blemishes.
 - .3 Replace defective or damaged materials with new.
 - .4 Develop Waste Reduction Workplan related to Work of this Section.

Part 2 Products

2.1 MATERIALS

- .1 Sound Baffle Partitions:
Rigid foil backed (foil on 2 sides) insulation 50 mm thickness c/w acoustic wall baffle and bracket detail. Non-combustible material. Joints are overlapped and tapped. Anchored rigid insulation to u/s of structure and isolated from ceiling grid.
- .2 Interior Partitions:
Acoustic batt and blanket mineral fibre: to CAN/ULC S702 or ASRM C665
 - .1 Type: 1.
 - .2 Thickness: as indicated.
 - .3 Combustibility: Non-Combustible
 - .4 Flame Spread = 0
 - .5 Smoke Developed = 0
 - .6 Acceptable Product: Roxul Safe'n'Sound or approved alternate.
- .3 Insulation clips:
Impale type, perforated 50 x 50 mm 2" x 2" cold rolled carbon steel 0.8 mm 20 gauge thick, adhesive back, spindle of 2.5 mm 12 gauge diameter annealed steel, length to suit insulation, 25 mm 1" diameter washers of self-locking type.
- .4 Nails:
galvanized steel, length to suit insulation plus 25 mm 1", to CSA B111.
- .5 Staples:
12 mm 1/2" minimum leg.
- .6 Tape:
as recommended by manufacturer.

Part 3 Execution

3.1 MANUFACTURER'S INSTRUCTIONS

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

3.2 INSULATION INSTALLATION

- .1 Fit insulation closely around electrical boxes, pipes, ducts, frames and other objects in or passing through insulation.
- .2 Fill all voids completely. Cut and trim insulation neatly to fill voids; leave no gaps.
- .3 Do not compress insulation to fit into spaces.

- .4 Keep insulation minimum 75 mm 3" from heat emitting devices such as recessed light fixtures, and minimum 50 mm 2" from side walls of CAN4-S604 type A chimneys and CAN/CGA-B149.1 and CAN/CGA-B149.2 type B and L vents.
- .5 Do not enclose insulation until installation has been reviewed by Consultant.

3.3 CLEANING

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

END OF SECTION

Part 1 General

1.1 REFERENCES

- .1 Health Canada/Workplace Hazardous Materials Information System (WHMIS)
 - .1 Material Safety Data Sheets (MSDS).
- .2 Underwriter's Laboratories of Canada (ULC)
 - .1 ULC-S115-11, Fire Tests of Fire stop Systems in accordance with 2015 NBC.

1.2 DEFINITIONS

- .1 Fire Stop Material: device intended to close off opening or penetration during fire or materials that fill openings in wall or floor assembly where penetration is by cables, cable trays, conduits, ducts and pipes and poke-through termination devices, including electrical outlet boxes along with their means of support through wall or floor openings.
- .2 Single Component Fire Stop System: fire stop material that has Listed Systems Design and is used individually without use of high temperature insulation or other materials to create fire stop system.
- .3 Multiple Component Fire Stop System: exact group of fire stop materials that are identified within Listed Systems Design to create on site fire stop system.

1.3 SUBMITTALS

- .1 Provide submittals in accordance with Section 01 33 00 Submittal Procedures.
- .2 Product Data:
 - .1 Submit manufacturer's printed product literature, specifications and datasheet and include product characteristics, performance criteria, physical size, finish and limitations.
 - .2 Submit two copies of WHMIS MSDS - Material Safety Data Sheets.
- .3 Shop Drawings:
 - .1 Submit shop drawings to show location, proposed material, reinforcement, anchorage, fastenings and method of installation.
 - .2 Construction details should accurately reflect actual job conditions.
- .4 Samples:
 - .1 Submit duplicate 300 x 300 mm samples showing actual fire stop material proposed for project.
- .5 Quality assurance submittals: submit following in accordance with Section 01 45 00 – Quality Control.

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

1.4 QUALITY ASSURANCE

- .1 Qualifications:
 - .1 Installer: company or person specializing in fire stopping installations with 5 years documented experience approved by manufacturer. All firestopping work to be by one installation contractor that is a member in good standing with the Firestop Contractors International Association. (FCIA).
- .2 Pre-Installation Meetings: convene pre-installation meeting one week prior to beginning work of this Section, with contractor's representative, owner and consultant(s) in accordance with Section 01 13 19 Project Meetings.
 - .1 Verify project requirements.
 - .2 Review installation and substrate conditions.
 - .3 Co-ordination with other building subtrades.
 - .4 Review manufacturer's installation instructions and warranty requirements.
- .3 Site Meetings: as part of Manufacturer's Services described in PART 3 - FIELD QUALITY CONTROL, schedule site visits, to review Work, at stages listed.
 - .1 After delivery and storage of products, and when preparatory Work is complete, but before installation begins.
 - .2 Twice during progress of Work at 25% and 60% complete.
 - .3 Upon completion of Work, after cleaning is carried out.

1.5 DELIVERY, STORAGE AND HANDLING

- .1 Packing, shipping, handling and unloading:
 - .1 Deliver, store and handle materials in accordance with Section 01 61 00 – Common Product Requirements.
 - .2 Deliver, store and handle materials in accordance with manufacturer's written instructions.

- .3 Deliver materials to the site in undamaged condition and in original unopened containers, marked to indicate brand name, manufacturer, ULC markings.
- .2 Storage and Protection:
 - .1 Store materials indoors in dry location and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.
 - .2 Replace defective or damaged materials with new.
- .3 Waste Management and Disposal:
 - .1 Separate waste materials for reuse and recycling in accordance with Section 01 74 11 Construction – Demolition Waste Management & Disposal.

Part 2 Products

2.1 MATERIALS

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

Part 3 Execution

3.1 MANUFACTURER'S INSTRUCTIONS

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

3.2 PREPARATION

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

3.3 INSTALLATION

- .1 Install fire stopping and smoke seal material and components in accordance with manufacturer's certified tested system listing.
- .2 Seal holes or voids made by through penetrations, poke-through termination devices, and unpenetrated openings or joints to ensure continuity and integrity of fire separation are maintained.
- .3 Provide temporary forming as required and remove forming only after materials have gained sufficient strength and after initial curing.
- .4 Tool or trowel exposed surfaces to neat finish.
- .5 Remove excess compound promptly as work progresses and upon completion.

3.4 SEQUENCES OF OPERATION

- .1 Proceed with installation only when submittals have been reviewed by Consultant(s).
- .2 Install floor fire stopping before interior partition erections.
- .3 Metal deck bonding: fire stopping to precede spray applied fireproofing to ensure required bonding.
- .4 Mechanical pipe insulation: certified fire stop system component.

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- .1 Ensure pipe insulation installation precedes fire stopping.

3.5 FIELD QUALITY CONTROL

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

3.6 CLEANING

- .1 Proceed in accordance with Section 01 74 00 Cleaning.
- .2 On completion and verification of performance of installation, remove surplus materials, excess materials, rubbish, tools and equipment.
- .3 Remove temporary dams after initial set of fire stopping and smoke seal materials.

3.7 SCHEDULE

- .1 Fire stop and smoke seal at existing and new constructions:
 - .1 Penetrations through fire-resistance rated masonry, concrete, and gypsum board partitions and walls.
 - .2 Top of fire-resistance rated masonry and gypsum board partitions.
 - .3 Intersection of fire-resistance rated masonry and gypsum board partitions.
 - .4 Control and sway joints in fire-resistance rated masonry and gypsum board partitions and walls.
 - .5 Penetrations through fire-resistance rated floor slabs, ceilings and roofs.
 - .6 Openings and sleeves installed for future use through fire separations.
 - .7 Around mechanical and electrical assemblies penetrating fire separations.
 - .8 Electrical outlet boxes installed within fire separation require fire stopping as required by the NBCC (3.1.9).
 - .9 Rigid ducts: greater than 129 cm²: fire stopping to consist of bead of fire stopping material between retaining angle and fire separation and between retaining angle and duct, on each side of fire separation.

END OF SECTION

Part 1 General

1.1 REFERENCES

- .1 American Society for Testing and Materials International, (ASTM)
 - .1 ASTM C834-17, Standard Specification for Latex Sealants.
 - .2 ASTM C920-18, Standard Specification for Elastomeric Joint Sealants.
 - .3 ASTM C919-02. Standard Practice for Use of Sealants in Acoustical Applications.
- .2 Canadian General Standards Board (CGSB)
 - .1 CAN/CGSB 19.13 Sealing Compound, One Component, Elastomeric, Chemical Curing.
- .3 Health Canada/Workplace Hazardous Materials Information System (WHMIS)
 - .1 Material Safety Data Sheets (MSDS).

1.2 ACTION & INFORMATION SUBMITTALS

- .1 Submit product data in accordance with Section 01 33 00 - Submittal Procedures.
- .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.

1.3 DELIVERY, STORAGE, AND HANDLING

- .1 Deliver, handle, store and protect materials in accordance with Section 01 61 00 - Common Product Requirements.
- .2 Deliver and store materials in original wrappings and containers with manufacturer's seals and labels, intact. Protect from freezing, moisture, water and contact with ground or floor.

1.4 SITE CONDITIONS

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

.3 Joint-Substrate Conditions:

- .1 Do not proceed with installation of joint sealants until contaminants capable of interfering with adhesion are removed from joint substrates.

1.5 ENVIRONMENTAL REQUIREMENTS

- .1 Comply with requirements of Workplace Hazardous Materials Information System (WHMIS) regarding use, handling, storage, and disposal of hazardous materials; and regarding labeling and provision of Material Safety Data Sheets (MSDS) acceptable to Labour Canada
- .2 Conform to manufacturer's recommended temperatures, relative humidity, and substrate moisture content for application and curing of sealants including special conditions governing use.

Part 2 Products

2.1 SEALANT MATERIALS

- .1 Do not use caulking that emits strong odours, contains toxic chemicals or is not certified as mould resistant in air handling units.
- .2 When low toxicity caulks are not possible, confine usage to areas which off-gas to exterior, are contained behind air barriers, or are applied several months before occupancy to maximize off-gas time.
- .3 Where sealants are qualified with primers use only these primers.

2.2 SEALANT MATERIAL DESIGNATIONS

- .1 Acrylic, One Part: To CGSB 19-GP-5M.
- .2 Silicone, One Part, Mildew Resistant: To ASTM C 920, Type S, Grade NS, Class 25.
- .3 Acoustical Sealant: To ASTM C 834.
- .4 Preformed Compressible and Non-Compressible back-up materials.
 - .1 Polyethylene, Urethane, Neoprene or Vinyl Foam.
 - .1 Extruded closed cell foam backer rod.
 - .2 Size: oversize 30 to 50 %.
 - .2 Neoprene or Butyl Rubber.
 - .1 Round solid rod, Shore A hardness 70.
 - .3 High Density Foam.
 - .1 Extruded closed cell polyvinyl chloride (PVC), extruded polyethylene, closed cell, Shore A hardness 20, tensile strength 140 to 200 kPa, extruded polyolefin foam, 32 kg/m³ density, or neoprene foam backer, size as recommended by manufacturer.

2.3 SEALANT SELECTION

- .1 Seal interior perimeters of exterior openings as detailed on drawings: Sealant type: acrylic.
- .2 Perimeters of interior frames, as detailed and itemized: Sealant type: acrylic.
- .3 Perimeter of tenant fixtures (e.g. sinks, basins, vanities): Sealant type: silicone, mildew resistant.
- .4 Exposed interior control joints in drywall: Sealant type: acrylic.

2.4 JOINT CLEANER

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

Part 3 Execution

3.1 PROTECTION

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

3.2 SURFACE PREPARATION

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

3.3 PRIMING

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

3.4 BACKUP MATERIAL

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

3.5 APPLICATION

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

END OF SECTION

RIDI #: 201900076
PSPC #: R.000000

**PSPC Winnipeg
SSC Depot**

SECTION 08 06 00
DOOR SCHEDULE

DOOR	ROOM	DOOR						FRAME			FIRE RATING	HDWE GROUP	REMARKS
NO.	NAME	WIDTH	HEIGHT	THICK.	TYPE	MAT	FIN	TYPE	MAT	FIN			
THIRD FLOOR													
ED700A	SSC DEPOT	915	2135	19	EX	EX	PT-6	EX	EX	PT-6	-	9	1, 2
ED700B	SSC DEPOT	915	2135	19	EX	EX	PT-6	EX	EX	PT-6	-	EX	

ABBREVIATIONS

ADO	AUTOMATIC DOOR OPENER	MIN	MINUTE	PF	PRE-FINISHED
BPG	BULLET PROOF GLASS	MT	METAL		
CA	CARD ACCESS	P	PAINT FINISH		
EX	EXISTING	REL	RELOCATED		
EXR	EXISTING RELOCATED	ST	STAIN FINISH		
HM	HOLLOW METAL	WD	WOOD		

NOTES IN REMARKS COLUMN

1. EXISTING CARD ACCESS TO REMAIN
2. ADO

GENERAL NOTES

- A. REFER TO DOOR HARDWARE SPECIFICATIONS FOR COMPLETE DOOR HARDWARE GROUP REQUIREMENTS

PSPC WINNIPEG ABW OFFICE FIT-UP

Project No.: R.067379

269 Main Street, Winnipeg, MB

Section 08 06 00

DOOR HARDWARE SETS

Page 1 of 1

Hardware Sets**Set: 9.0**

1 Auto Operator	5740	689	NORTON
2 Full Height Switches	639		NORTON

NOTE: Outside switch disabled when door is locked. Swiping valid card will release the electric strike and enable the outside switch, which will power open the door when pressed. Pressing the inside switch will always release the electric strike and power open the door.

PART 1 - GENERAL

1.1 Section includes

Furnishing all labour, materials, equipment, supervision, incidentals and all other miscellaneous works required to complete the work as shown and detailed on the drawings and/or as specified herein.

1.2 Standards

- .1 The work under this section shall be carried out in strict accordance with the requirements of WHMIS.

PART 2 - PRODUCTS

2.1 Materials

- .1 Gypsum board shall conform to C.S.A. A82.27 and shall not be less than 12 mm thick on supports not more than 406 mm o.c. (16 mm on supports, not more than 610 mm o.c.). Gypsum board shall conform to fire ratings designated by the Manitoba Building Code. In cases where loose fill insulation is used in attic space, gypsum board ceilings below shall be 16 mm thick. Cement board repair to be made with similar material.
- .2 Nails for fastening gypsum board to wood supports shall not be less than 13 gauge annular grooved nails with a head diameter of 6 mm.
- .3 Drywall screws: #6 U.S. gauge x 32 mm long minimum, longer lengths to suit conditions and details. For fire rated installations, adjust length and penetration to suit conditions and to meet the requirements of local codes.
- .4 Joint reinforcing tapes: Standard Perforated Paper tape 50 mm wide or approved equal. Fibreglass mesh tape shall be used on cement board or waterproof drywall board.
- .5 Drywall trim: corner beads (90 degree square), plasterboard stops and control joints of tape-on, paper faced trim galvanized metal, installed with joint finishing compound.
- .6 Joint filler and topping cement: As recommended by wallboard manufacturer.
- .7 Accessories: Manufacturer's standard clips, splices and accessories as required.

PART 3 - EXECUTION

3.1 Application

- .1 Repair drywall on all walls and ceilings at cracks, holes and all other damage.

-
- .2 Carefully lay out work to minimize joints.
 - .3 The screws shall be spaced not more than 300 mm o.c. along supports except that on vertical surfaces the screws may be spaced 400 mm o.c., where the supports are not more than 400 mm o.c. The uppermost wall screws shall not be more than 200 mm below the ceiling.
 - .4 Tape and fill cracks and holes with joint compound, sanding between coats.
 - .5 Provide metal edge trim, casing beads, etc. wherever required. Erect metal trim plumb and level using longest practical lengths of material.
 - .6 Surfaces to receive tape shall be clean, and torn paper or loose material shall be removed. Openings greater than 3 mm shall be filled with patching plaster that is allowed to dry before joint tape cement is applied.
 - .7 External corners shall be protected with paper faced corner beads. All corner beads shall be taped on.
 - .8 A band of joint cement about 125 mm wide shall be applied along the joints to embed the tape. The tape shall be smoothed out and excess cement removed with a suitable spreader tool.
 - .9 After the cement has dried; a second layer of cement shall be applied so that it completely covers the tape. The edges of the cement shall be feathered to provide a band about 200 mm wide where the joints are recessed and 250 mm wide where the joints are not recessed.
 - .10 After the second layer is dry; a third layer of cement shall be applied and feathered to provide a band about 250 mm wide where the joints are recessed and 400 mm wide where the joints are not recessed.
 - .11 After the third layer of cement has dried; all rough and uneven areas shall be sanded to provide a smooth even surface.
 - .12 Finished work shall be smooth, seamless, true and flush, with square neat corners.

END OF SECTION

RIDI #: 201900076
 PWGSC #: R.000000

**PSPC Winnipeg
 SSC Depot**

09 06 10
MATERIAL SCHEDULE
 PAGE: 1 OF 1

SPEC SECTION	FINISH CODE	FINISH CODE		PRODUCT / MANUFACTURER / SPECIAL INSTRUCTIONS
09 65 00	RB-1	RUBBER BASE	<i>Acceptable Manufacturer:</i>	Johnsonite
			<i>Style:</i>	Monument
			<i>Colour:</i>	Burnt Umber
			<i>Dimension:</i>	4"
09 65 00	RSF-1	RUBBER TILE FLOORING	<i>Acceptable Manufacturer:</i>	Johnsonite
			<i>Style:</i>	MicroTone - Speckled Rubber Tile
			<i>Colour:</i>	HNSP-LB9, Rainstorm WG
			<i>Dimension:</i>	24" x 24"
09 91 23	PT-1	PAINT	<i>Description:</i>	Zero VOC Paint
		GENERAL WALL COLOUR	<i>Colour:</i>	White - To match Benjamin Moore Chantilly Lace OC-65
			<i>VOC:</i>	Zero VOC
			<i>Sheen:</i>	Satin
			<i>Special Requirements:</i>	Excellent Durability
			<i>Locations:</i>	General wall colour
09 91 23	PT-4	PAINT	<i>Description:</i>	Zero VOC Paint
		ACCENT COLOUR	<i>Colour:</i>	Aqua - To match Sherwin Williams Tranquil Aqua SW 7611/ 281-C4
			<i>VOC:</i>	Zero VOC
			<i>Sheen:</i>	Satin
			<i>Special Requirements:</i>	Excellent Durability
09 91 23	PT-6	PAINT	<i>Description:</i>	Zero VOC Paint
		DOOR FRAMES	<i>Colour:</i>	Dark Grey- To match Benjamin Moore Iron Mountain 2134-30
			<i>VOC:</i>	Zero VOC
			<i>Sheen:</i>	Semi-Gloss
			<i>Special Requirements:</i>	Excellent Durability

Part 1 General

1.1 RELATED REQUIREMENTS

- .1 Section 09 06 10 – Material Schedule.

1.2 REFERENCES

- .1 ASTM F1303 – Standard Specification for Sheet Vinyl Floor Covering with Backing.

1.3 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Submit samples in accordance with Section 01 33 00.
- .2 Samples: Submit two samples, 12" x 12" in size illustrating colour and pattern for each floor material for each colour specified.
- .3 Submit two 12" long samples of base, transition strips and stair material for each colour specified.

1.4 MAINTENANCE MATERIAL SUBMITTALS

- .1 Provide extra materials of resilient sheet flooring and adhesives in accordance with Section 01 78 00 - Closeout Submittals.
- .2 Provide 5% of each colour, pattern and type of flooring material required for project for maintenance use.
- .3 Extra materials one piece and from same production run as installed materials.
- .4 Identify each roll of sheet flooring and each container of adhesive.
- .5 Deliver to Consultant, upon completion of the work of this section.
- .6 Store where directed by Consultant.

1.5 DELIVERY, STORAGE AND HANDLING

- .1 Deliver, store and handle materials in accordance with Section 01 61 00 – Common Product Requirements.
- .2 Delivery and Acceptance Requirements: deliver materials to site in original factory packaging, labelled with manufacturer's name and address.
- .3 Storage and Handling Requirements:
 - .1 Store materials in dry location indoors off ground and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.
 - .2 Store and protect specified materials from nicks, scratches, and blemishes.
 - .3 Replace defective or damaged materials with new.

1.6 SITE CONDITIONS

- .1 Ambient Conditions:
 - .1 Maintain air temperature and structural base temperature at flooring installation area above 20 degrees for 48 hours before, during and 48 hours

after installation.

Part 2 Products

2.1 MATERIALS

- .1 Colour and finish: Refer to Section 09 06 00 Material Schedule: RSF-1 RUBBER TILE FLOORING.
- .2 All RSF seams to be watertight, as applicable to material.

2.2 MATERIALS - BASE

- .1 Refer to Section 09 06 00 Material Schedule: RB-1 RUBBER BASE.
- .2 Resilient base: continuous, top set, complete with pre-Moulded end stops and external corners:
 - .1 Type: rubber.
 - .2 Style: Toeless (straight).
 - .3 Thickness: 3.17 mm.
 - .4 Height: 101.6 mm.
 - .5 Lengths: continuous roll material
 - .6 Colours: Burnt Umber

2.3 THRESHOLDS

- .1 Refer to Section 09 06 00 Material Schedule finish code: Threshold.

2.4 ACCESSORIES

- .1 Subfloor Filler: White premix latex; type recommended by adhesive material manufacturer.
- .2 Primers and Adhesives: Waterproof; types recommended by flooring manufacturer.
- .3 Cove Former: Plastic.
- .4 Sealer and Wax: Types recommended by flooring manager.

Part 3 Execution

3.1 EXAMINATION

- .1 Verify concrete floors are dry to a maximum moisture content acceptable to flooring and adhesive manufacturer, and exhibit negative alkalinity, carbonization, or dusting.
- .2 For renovation work, the existing substrate floor and lower wall surfaces must be acceptable to receive new floor and base adhesives. Supplement the following paragraph to address specific project conditions.
- .3 Verify floor and lower wall surfaces are free of substances that may impair adhesion of new adhesive and finish materials.

3.2 PREPARATION

- .1 Remove sub-floor ridges and bumps. Fill minor or local low spots, cracks, joints, holes, and other defects with sub-floor filler to achieve smooth, flat, hard surface.
- .2 Prohibit traffic until filler is cured.
- .3 Vacuum clean substrate.
- .4 Apply primer to surfaces.

3.3 INSTALLATION – FLOORING

- .1 Install in accordance with manufacturer's instructions.
- .2 Spread only enough adhesive to permit installation of materials before initial set.
- .3 Set flooring in place, press with heavy roller to attain full adhesion.
- .4 Lay flooring with joints and seams parallel to building lines to produce minimum number of seams.
- .5 Install sheet flooring parallel to length of room. Provide minimum of 1/3 full roll width. Double cut sheet; provide continuously sealed joints.
- .6 Terminate flooring at centerline of door openings where adjacent floor finish is dissimilar.
- .7 Turn up flooring to form base where shown. Back floor and wall junction with cant strip. Taper cant strip at door frames to prevent cove from protruding past frame.

3.4 INSTALLATION – RUBBER BASE

- .1 Fit joints tight and vertical. Maintain minimum measurement of 45 mm between joints.
- .2 Miter internal corners. At external corners, 'V' cut back of base strip to 2/3 of its thickness and fold.
- .3 Install base on solid backing. Bond tight to wall and floor surfaces.
- .4 Scribe and fit to door frames and other interruptions.

3.5 INSTALLATION – THRESHOLD

- .1 Install threshold in one piece at centre line of door or at dissimilar materials indicated on drawings.

3.6 CLEANING

- .1 Section 01 74 11: Cleaning.
- .2 Remove excess adhesive from floor, base, and wall surfaces without damage.
- .3 Clean, seal, and wax floor and base surfaces in accordance with manufacturer's instructions.
- .4 Clean as per manufactures recommendations

3.7 PROTECTION OF FINISHED WORK

- .1 Prohibit traffic on floor for 48 h after installation.

END OF SECTION

Part 1 General

1.1 REFERENCES

- .1 Health Canada / Workplace Hazardous Materials Information System (WHMIS)
 - .1 Material Safety Data Sheets (MSDS).
- .2 Master Painters Institute (MPI)
 - .1 MPI Architectural Painting Specifications Manual.

1.2 QUALITY ASSURANCE

- .1 Qualifications:
 - .1 Contractor: minimum of five years proven satisfactory experience. Provide list of last three comparable jobs including, job name and location, specifying authority, and project manager.
 - .2 Journeymen: qualified journeymen who have "Tradesman Qualification Certificate of Proficiency" engaged in painting work.
 - .3 Apprentices: working under direct supervision of qualified trades' person in accordance with trade regulations.

1.3 SCHEDULING

- .1 Submit work schedule for various stages of painting to Consultant for review. Submit schedule minimum of 48 hours in advance of proposed operations.
- .2 Obtain written authorization from Consultant for changes in work schedule.
- .3 Schedule painting operations to prevent disruption of occupants.

1.4 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Submittals in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Product Data:
 - .1 Submit product data and instructions for each paint and coating product to be used.
 - .2 Submit product data for the use and application of paint thinner.
 - .3 Submit two copies of Workplace Hazardous Materials Information System (WHMIS) Material Safety Data Sheets (MSDS) in accordance with Section 01 33 00 - Submittal Procedures. Indicate VOCs during application and curing.
- .3 Samples:
 - .1 Submit full range colour sample chips to indicate where colour availability is restricted.
 - .2 Submit duplicate 200 x 300 mm sample panels of each paint and stain with specified paint or coating in colours, gloss/sheen and textures required to MPI, Premium Grade.

- .3 Architectural Painting Specification Manual standards submitted on following substrate materials:
 - .1 3 mm for finishes over metal surfaces.
 - .2 13 mm plywood for finishes over wood surfaces.
 - .3 13 mm gypsum board for finishes over gypsum board and other smooth surfaces.
- .4 Retain reviewed samples on-site to demonstrate acceptable standard of quality for appropriate on-site surface.
- .5 Test reports: submit certified test reports for paint from approved independent testing laboratories, indicating compliance with specifications for specified performance characteristics and physical properties.
 - .1 Lead, cadmium and chromium: presence of and amounts.
 - .2 Mercury: presence of and amounts.
 - .3 Organochlorines and PCBs: presence of and amounts.
- .6 Certificates: submit certificates signed by manufacturer certifying that materials comply with specified performance characteristics and physical properties.
- .7 Manufacturer's Instructions:
 - .1 Submit manufacturer's installation application instructions.
- .8 Closeout Submittals: submit maintenance data for incorporation into manual specified in Section 01 78 00 - Closeout Submittals include following:
 - .1 Product name, type and use.
 - .2 Manufacturer's product number.
 - .3 Colour number[s].
 - .4 MPI Environmentally Friendly classification system rating.

1.5 MAINTENANCE

- .1 Extra Materials:
 - .1 Deliver to extra materials from same production run as products installed. Package products with protective covering and identify with descriptive labels. Comply with Section 01 78 00 - Closeout Submittals.
 - .2 Quantity: provide one - four litre can of each type and colour of finish coating. Identify colour and paint type in relation to established colour schedule and finish system.
 - .3 Delivery, storage and protection: comply with Consultant requirements for delivery and storage of extra materials.

1.6 DELIVERY, STORAGE AND HANDLING

- .1 Packing, Shipping, Handling and Unloading:

- .1 Pack, ship, handle and unload materials in accordance with Section 01 61 00 - Common Product Requirements and manufacturer's written instructions.
- .2 Acceptance at Site:
 - .1 Identify products and materials with labels indicating:
 - .1 Manufacturer's name and address.
 - .2 Type of paint or coating.
 - .3 Compliance with applicable standard.
 - .4 Colour number in accordance with established colour schedule.
- .3 Remove damaged, opened and rejected materials from site.
- .4 Storage and Protection:
 - .1 Provide and maintain dry, temperature controlled, secure storage.
 - .2 Store materials and supplies away from heat generating devices.
 - .3 Store materials and equipment in well ventilated area with temperature range 7 degrees C to 30 degrees C.
- .5 Store temperature sensitive products above minimum temperature as recommended by manufacturer.
- .6 Keep areas used for storage, cleaning and preparation clean and orderly. After completion of operations, return areas to clean condition.
- .7 Remove paint materials from storage only in quantities required for same day use.
- .8 Fire Safety Requirements:
 - .1 Provide one 9 kg Type ABC fire extinguisher adjacent to storage area.
 - .2 Store oily rags, waste products, empty containers and materials subject to spontaneous combustion in ULC approved, sealed containers and remove from site on a daily basis.
 - .3 Handle, store, use and dispose of flammable and combustible materials in accordance with National Fire Code of Canada requirements.

1.7 SITE CONDITIONS

- .1 Heating, Ventilation and Lighting:
 - .1 Provide heating facilities to maintain ambient air and substrate temperatures above 10 degrees C for 24 hours before, during and after paint application until paint has cured sufficiently.
 - .2 Provide continuous ventilation for seven days after completion of application of paint.
 - .3 Coordinate use of existing ventilation system with Consultant and ensure its operation during and after application of paint as required.

- .4 Provide temporary ventilating and heating equipment where permanent facilities are not available or supplemental ventilating and heating equipment if ventilation and heating from existing system is inadequate to meet minimum requirements.
- .5 Provide minimum lighting level of 323 Lux on surfaces to be painted.
- .2 Temperature, Humidity and Substrate Moisture Content Levels:
 - .1 Unless pre-approved written approval by product manufacturer, perform no painting when:
 - .1 Ambient air and substrate temperatures are below 10 degrees C.
 - .2 Substrate temperature is above 32 degrees C unless paint is specifically formulated for application at high temperatures.
 - .3 Substrate and ambient air temperatures are not expected to fall within MPI or paint manufacturer's prescribed limits.
 - .4 The relative humidity is under 85% or when the dew point is more than 3 degrees C variance between the air/surface temperature. Paint should not be applied if the dew point is less than 3 degrees C below the ambient or surface temperature. Use sling psychrometer to establish the relative humidity before beginning paint work.
 - .5 Rain or snow are forecast to occur before paint has thoroughly cured or when it is foggy, misty, raining or snowing at site.
 - .6 Ensure that conditions are within specified limits during drying or curing process, until newly applied coating can itself withstand 'normal' adverse environmental factors.
 - .2 Perform painting work when maximum moisture content of the substrate is below:
 - .1 Allow new concrete and masonry to cure minimum of 28 days.
 - .2 15% for wood.
 - .3 12% for plaster and gypsum board.
 - .3 Test for moisture using calibrated electronic Moisture Meter. Test concrete floors for moisture using "cover patch test".
 - .4 Test concrete, masonry and plaster surfaces for alkalinity as required.
- .3 Surface and Environmental Conditions:
 - .1 Apply paint finish in areas where dust is no longer being generated by related construction operations or when wind or ventilation conditions are such that airborne particles will not affect quality of finished surface.
 - .2 Apply paint to adequately prepared surfaces and to surfaces within moisture limits.
 - .3 Apply paint when previous coat of paint is dry or adequately cured.

.4 Additional interior application requirements:

- .1 Apply paint finishes when temperature at location of installation can be satisfactorily maintained within manufacturer's recommendations.
- .2 Apply paint in occupied facilities during silent hours only. Schedule operations to approval of Consultant such that painted surfaces will have dried and cured sufficiently before occupants are affected.

Part 2 Products

2.1 MATERIALS

- .1 Refer to Section 09 06 00 Material Schedule: PT-1, PT-4, & PT-6
- .2 Paint materials listed in the MPI Approved Products List (APL) are acceptable for use on this project.
- .3 Provide paint materials for paint systems from single manufacturer.
- .3 Only qualified products with E2 "Environmentally Friendly" rating are acceptable for use on this project.
- .4 Conform to latest MPI requirements for interior painting work including preparation and priming.
- .5 Materials (primers, paints, coatings, varnishes, stains, lacquers, fillers, thinners, solvents, etc.) in accordance with MPI Architectural Painting Specification Manual "Approved Product" listing.
- .6 Linseed oil, shellac, and turpentine: highest quality product from approved manufacturer listed in MPI Architectural Painting Specification Manual, compatible with other coating materials as required.
- .7 Provide paint products meeting MPI "Environmentally Friendly" E2 ratings based on VOC (EPA Method 24) content levels.
- .8 Use MPI listed materials having minimum E2 rating where indoor air quality (odour) requirements exist.

2.2 MIXING AND TINTING

- .1 Perform colour tinting operations prior to delivery of paint to site. Obtain written approval from Consultant for tinting of painting materials.
- .2 Mix paste, powder or catalyzed paint mixes in accordance with manufacturer's written instructions.
- .3 Use and add thinner in accordance with paint manufacturer's recommendations. Do not use kerosene or similar organic solvents to thin water-based paints.
- .4 Thin paint for spraying in accordance with paint manufacturer's instructions.
- .5 Re-mix paint in containers prior to and during application to ensure break-up of lumps, complete dispersion of settled pigment, and colour and gloss uniformity.

2.3 GLOSS/SHEEN RATINGS

- .1 Paint gloss is defined as sheen rating of applied paint, in accordance with following values:

Gloss Level	Description	Gloss @ 60 degrees	Sheen @ 85 degrees
G1	Matte Finish (flat)	0 to 5	10 max.
G2	Velvet-like Finish	0 to 10	10 to 35
G3	Eggshell Finish	10 to 25	10 to 35
G4	Satin-like Finish	20 to 35	35 min.
G5	Traditional Semi-Gloss Finish	35 to 70	-
G6	Traditional Gloss	70 to 85	-
G7	High Gloss Finish	More than 85	

- .2 Gloss level ratings of painted surfaces as noted on Section 09 06 00 Material Schedule.

2.4 INTERIOR PAINTING SYSTEMS

- .1 Dressed lumber: including doors, door and window frames, casings, moldings:
- .1 INT 6.3V - Institutional low odour/low VOC G5 finish.
- .2 Plaster and gypsum board: gypsum wallboard, drywall, "sheet rock type material", and textured finishes:
- .1 INT 9.2F - Waterborne epoxy (tile-like) finish.
- .2 INT 9.2M - Institutional low odour/low VOC G5 finish.

2.5 SOURCE QUALITY CONTROL

- .1 Perform following tests on each batch of consolidated post-consumer material before surface coating is reformulated and canned. Testing by laboratory or facility which has been accredited by Standards Council of Canada.
- .1 Lead, cadmium and chromium are to be determined using ICP-AES (Inductively Coupled Plasma - Atomic Emission Spectroscopy) technique no. 6010 as defined in EPA SW-846.
- .2 Mercury is to be determined by Cold Vapour Atomic Absorption Spectroscopy using Technique no. 7471 as defined in EPA SW-846.
- .3 Organochlorines and PCBs are to be determined by Gas Chromatography using Technique no. 8081 as defined in EPA SW-846.

Part 3 Execution

3.1 MANUFACTURER'S INSTRUCTIONS

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

3.2 GENERAL

- .1 Perform preparation and operations for interior painting in accordance with MPI Architectural Painting Specifications Manual except where specified otherwise.
- .2 Apply paint materials in accordance with paint manufacturer's written application instructions.
- .3 Paint and quality of work shall conform to MPI, Premium Grade.

3.3 EXAMINATION

- .1 Investigate existing substrates for problems related to proper and complete preparation of surfaces to be painted. Report to Consultant damages, defects, unsatisfactory or unfavourable conditions before proceeding with work.
- .2 Conduct moisture testing of surfaces to be painted using properly calibrated electronic moisture meter, except test concrete floors for moisture using simple "cover patch test". Do not proceed with work until conditions fall within acceptable range as recommended by manufacturer.
- .3 Maximum moisture content as follows:
 - .1 Stucco, plaster and gypsum board: 12%.
 - .2 Concrete: 12%.
 - .3 Clay and Concrete Block/Brick: 12%.
 - .4 Wood: 15%.

3.4 PREPARATION

- .1 Protection:
 - .1 Protect existing building surfaces and adjacent structures from paint spatters, markings and other damage by suitable non-staining covers or masking. If damaged, clean and restore surfaces as directed by Consultant.
 - .2 Protect items that are permanently attached such as Fire Labels on doors and frames.
 - .3 Protect factory finished products and equipment.
 - .4 Protect passing pedestrians, building occupants and general public in and about the building.

-
- .2 Surface Preparation:
 - .1 Remove electrical cover plates, light fixtures, surface hardware on doors, bath accessories and other surface mounted equipment, fittings and fastenings prior to undertaking painting operations. Identify and store items in secure location and re-installed after painting is completed.
 - .2 Move and cover furniture and portable equipment as necessary to carry out painting operations. Replace as painting operations progress.
 - .3 Place "WET PAINT" signs in occupied areas as painting operations progress. Signs to approval of Consultant.
 - .3 Clean and prepare surfaces in accordance with MPI Architectural Painting Specification Manual requirements. Refer to MPI Manual in regard to specific requirements and as follows:
 - .1 Remove dust, dirt, and other surface debris by vacuuming, wiping with dry, clean cloths or compressed air.
 - .2 Wash surfaces with a biodegradable detergent and bleach where applicable and clean warm water using a stiff bristle brush to remove dirt, oil and other surface contaminants.
 - .3 Rinse scrubbed surfaces with clean water until foreign matter is flushed from surface.
 - .4 Allow surfaces to drain completely and allow to dry thoroughly.
 - .5 Prepare surfaces for water-based painting, water-based cleaners should be used in place of organic solvents.
 - .6 Use trigger operated spray nozzles for water hoses.
 - .7 Many water-based paints cannot be removed with water once dried. Minimize use of mineral spirits or organic solvents to clean up water-based paints.
 - .4 Clean following surfaces with high pressure water washing.
 - .5 Prevent contamination of cleaned surfaces by salts, acids, alkalis, other corrosive chemicals, grease, oil and solvents before prime coat is applied and between applications of remaining coats. Apply primer, paint, or pretreatment as soon as possible after cleaning and before deterioration occurs.
 - .6 Where possible, prime non-exposed surfaces of new wood surfaces before installation. Use same primers as specified for exposed surfaces.
 - .1 Apply vinyl sealer to MPI #36 over knots, pitch, sap and resinous areas.
 - .2 Apply wood filler to nail holes and cracks.
 - .3 Tint filler to match stains for stained woodwork.
 - .7 Sand and dust between coats as required to provide adequate adhesion for next coat and to remove defects visible from a distance up to 1000 mm.

- .8 Touch up of shop primers with primer as specified.
- .9 Do not apply paint until prepared surfaces have been accepted by Consultant.

3.5 APPLICATION

- .1 Method of application to be as approved by Consultant. Conform to manufacturer's application instructions unless specified otherwise.
- .2 Paint and quality of work shall conform to MPI, Premium Grade.
- .3 Brush and Roller Application:
 - .1 Apply paint in uniform layer using brush and/or roller type suitable for application.
 - .2 Work paint into cracks, crevices and corners.
 - .3 Paint surfaces and corners not accessible to brush using spray, daubers and/or sheepskins. Paint surfaces and corners not accessible to roller using brush, daubers or sheepskins.
 - .4 Brush and/or roll out runs and sags, and over-lap marks. Rolled surfaces free of roller tracking and heavy stipple.
 - .5 Remove runs, sags and brush marks from finished work and repaint.
- .4 Spray application:
 - .1 Provide and maintain equipment that is suitable for intended purpose, capable of atomizing paint to be applied, and equipped with suitable pressure regulators and gauges.
 - .2 Keep paint ingredients properly mixed in containers during paint application either by continuous mechanical agitation or by intermittent agitation as frequently as necessary.
 - .3 Apply paint in uniform layer, with overlapping at edges of spray pattern. Back roll first coat application.
 - .4 Brush out immediately all runs and sags.
 - .5 Use brushes and rollers to work paint into cracks, crevices and places which are not adequately painted by spray.
- .4 Use dipping, sheepskins or daubers only when no other method is practical in places of difficult access.
- .5 Apply coats of paint continuous film of uniform thickness. Repaint thin spots or bare areas before next coat of paint is applied.
- .6 Allow surfaces to dry and properly cure after cleaning and between subsequent coats for minimum time period as recommended by manufacturer.
- .7 Sand and dust between coats to remove visible defects.

- .8 Finish surfaces both above and below sight lines as specified for surrounding surfaces, including such surfaces as tops of interior cupboards and cabinets and projecting ledges.
- .9 Finish inside of cupboards and cabinets as specified for outside surfaces.
- .10 Finish closets and alcoves as specified for adjoining rooms.
- .11 Finish top, bottom, edges and cutouts of doors after fitting as specified for door surfaces.

3.6 MECHANICAL/ELECTRICAL EQUIPMENT

- .1 Paint finished area exposed conduits, piping, hangers, ductwork and other mechanical and electrical equipment with colour and finish to match adjacent surfaces, except as indicated.
- .2 Boiler room, mechanical and electrical rooms: paint exposed conduits, piping, hangers, ductwork and other mechanical and electrical equipment.
- .3 Other unfinished areas: leave exposed conduits, piping, hangers, ductwork and other mechanical and electrical equipment in original finish and touch up scratches and marks.
- .4 Touch up scratches and marks on factory painted finishes and equipment with paint as supplied by manufacturer of equipment.
- .5 Do not paint over nameplates.
- .6 Keep sprinkler heads free of paint.
- .7 Paint inside of ductwork where visible behind grilles, registers and diffusers with primer and one coat of matt black paint.
- .8 Paint fire protection piping red.
- .9 Paint disconnect switches for fire alarm system and exit light systems in red enamel.
- .10 Paint natural gas piping yellow.
- .11 Paint both sides and edges of backboards for telephone and electrical equipment before installation. Leave equipment in original finish except for touch-up as required, and paint conduits, mounting accessories and other unfinished items.
- .12 Do not paint interior transformers and substation equipment.

3.7 SITE TOLERANCES

- .1 Walls: no defects visible from a distance of 1000 mm at 90 degrees to surface.
- .2 Ceilings: no defects visible from floor at 45 degrees to surface when viewed using final lighting source.
- .3 Final coat to exhibit uniformity of colour and uniformity of sheen across full surface area.

3.8 FIELD QUALITY CONTROL

- .1 Interior painting and decorating work shall be inspected by a Paint Inspection Agency (inspector) acceptable to the specifying authority and local Painting Contractor's Association. Painting contractor shall notify Paint Inspection Agency a minimum of

one week prior to commencement of work and provide a copy of project painting specification, plans and elevation drawings (including pertinent details) as well as a Finish Schedule.

- .2 Interior surfaces requiring painting shall be inspected by Paint Inspection Agency who shall notify Consultant and General Contractor in writing of defects or problems, prior to commencing painting work, or after prime coat shows defects in substrate.
- .3 Where "special" painting, coating or decorating system applications (i.e. elastomeric coatings) or non-MPI listed products or systems are to be used, paint or coating manufacturer shall provide as part of this work, certification of surfaces and conditions for specific paint or coating system application as well as on site supervision, inspection and approval of their paint or coating system application as required at no additional cost to Consultant.
- .4 Standard of Acceptance:
 - .1 Walls: no defects visible from a distance of 1000 mm at 90 degrees to surface.
 - .2 Ceilings: no defects visible from floor at 45 degrees to surface when viewed using final lighting source.
 - .3 Final coat to exhibit uniformity of colour and uniformity of sheen across full surface area.
- .5 Field inspection of painting operations to be carried out by independent inspection firm as designated by Consultant.
- .6 Advise Consultant when surfaces and applied coating is ready for inspection. Do not proceed with subsequent coats until previous coat has been approved.
- .7 Cooperate with inspection firm and provide access to areas of work.
- .8 Retain purchase orders, invoices and other documents to prove conformance with noted MPI requirements when requested by Consultant.

3.9 RESTORATION

- .1 Clean and re-install hardware items removed before undertaken painting operation.
- .2 Remove protective coverings and warning signs as soon as practical after operations cease.
- .3 Remove paint splashes on exposed surfaces that were not painted. Remove smears and spatter immediately as operations progress, using compatible solvent.
- .4 Protect freshly completed surfaces from paint droppings and dust to approval of Consultant. Avoid scuffing newly applied paint.
- .5 Restore areas used for storage, cleaning, mixing and handling of paint to clean condition as approved by Consultant.

END OF SECTION

Part 1 General

1.1 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Submittals in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Product Data:
 - .1 Submit product data and instructions for each product to be used.
- .3 Samples:
 - .1 Selection Samples: For each finish product specified, two full-size signs representing manufacturer's full range of available colors and patterns.
 - .2 Verification Samples: For each finish product specified, two full-size signs representing actual product, colour, and patterns.
 - .3 Manufacturer's Instructions:
 - .1 Submit manufacturer's installation application instructions.
 - .4 Closeout Submittals: submit maintenance data for incorporation into manual specified in Section 01 78 00 - Closeout Submittals include following:
 - .1 Product name, type and use.
 - .2 Manufacturer's product number.
 - .3 Colour number[s].

1.2 MAINTENANCE

- .1 Extra Materials:
 - .1 Deliver to extra materials from same production run as products installed. Package products with protective covering and identify with descriptive labels. Comply with Section 01 78 00 - Closeout Submittals.
 - .2 Quantity: provide one - four litre can of each type and colour of finish coating. Identify colour and paint type in relation to established colour schedule and finish system.
 - .3 Delivery, storage and protection: comply with Consultant requirements for delivery and storage of extra materials.

1.3 DELIVERY, STORAGE AND HANDLING

- .1 Packing, Shipping, Handling and Unloading:
 - .1 Pack, ship, handle and unload materials in accordance with manufacturer's written instructions.
 - .1 Identify products and materials with labels indicating:
 - .1 Manufacturer's name and address.
- .2 Storage and Protection:
 - .1 Store products in accordance with manufacturer's requirements.

- .2 Store products in manufacturer's unopened packaging with labels intact until ready for installation.
- .3 Store temperature sensitive products above minimum temperature as recommended by manufacturer.

1.4 SITE CONDITIONS

- .1 Maintain environmental conditions (temperature, humidity, and ventilation) within limits recommended by manufacture for optimum results. Do not install products under environmental conditions outside manufacture's absolute limits.

2.1 MANUFACTUERERS

- .1 Acceptable manufacturer:
Match Existing

2.4 INTERIOR SIGNAGE

- .1 Architectural Signage System: To match existing

- .1 Provide two signs:
 - .1 Sign A: on door ED700A
 - .1 Copy:
Shared Services Canada
Exchange Depot

By appointment only.

First, please contact your Service Desk. Then, if an appointment is required, our staff will contact you.

Services partagés Canada
Station d'échange

Par rendez-vous seulement.

Veillez d'abord communiquer avec votre bureau de soutien. Si un rendez-vous devient nécessaire, nous communiquerons avec vous.

- .2 Sign B: in Lobby
 - .1 Copy:
Shared Services Canada /Services partagés Canada
Exchange depot/Station d'échange

- .2 Colours, Finishes, Size, and Formatting to be provided and approved by designer.

Part 3 Execution

3.1 MANUFACTURER'S INSTRUCTIONS

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

3.2 GENERAL

- .1 Perform preparation and operations for interior painting in accordance with MPI Architectural Painting Specifications Manual except where specified otherwise.
- .2 Apply paint materials in accordance with paint manufacturer's written application instructions.
- .3 Paint and quality of work shall conform to MPI, Premium Grade.

3.3 EXAMINATION

- .1 Do not begin installation until substrates have been properly prepared.

3.4 PREPARATION

- .1 Clean surfaces thoroughly prior to installation
- .2 Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.

3.5 INSTALLATION

- .4 Install in accordance with manufacturer's instructions.
- .5 Sign locations to be determined by designer.
- .6 Install signs plumb and square.

END OF SECTION

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END OF TABLE

Part 1 General**1.1 SUMMARY****.1 Section Includes:**

- .1 Use of mechanical systems during construction.

1.2 USE OF SYSTEMS**.1 Use of new and existing permanent heating and ventilating systems for supplying temporary ventilation and heat is permitted only under following conditions:**

- .1 Entire system is complete, pressure tested, cleaned, flushed out.
- .2 Specified water treatment system has been commissioned, water treatment is being continuously monitored.
- .3 Building has been closed in, areas to be heated/ventilated are clean and will not thereafter be subjected to dust-producing processes.
- .4 There is no possibility of damage.
- .5 Supply ventilation systems are protected by 60 % filters, inspected daily, changed every week 2 weeks or more frequently as required.
- .6 Return and exhaust systems have approved 30% filters over openings, inlets, outlets.
- .7 Systems will be:
 - .1 Operated as per manufacturer's recommendations and instructions.
 - .2 Operated by Contractor.
 - .3 Monitored continuously by Contractor.
- .8 Warranties and guarantees are not relaxed.
- .9 Regular preventive and other manufacturers recommended maintenance routines are performed by Contractor at own expense and under supervision of DCC Representative Departmental Representative .
- .10 Refurbish entire system before static completion; clean internally and externally, restore to "as- new" condition, replace filters in air systems.

.2 Filters specified in this Section are over and above those specified in other Sections of this project.**Part 2 Products****2.1 NOT USED****.1 Not Used.**

Part 3 Execution

3.1 NOT USED

.1 Not Used.

END OF SECTION

Part 1 General

1.1 REFERENCE STANDARDS

- .1 National Air Duct Cleaners Association (NADCA)
 - .1 ACR Standard, 2006 edition: Assessment, Cleaning and Restoration of HVAC Systems.

1.2 DEFINITIONS

- .1 HVAC System: complete air duct system in renovated area and including:
 - .1 Fans, fan blades and fan housing;
 - .2 Acoustically insulated duct linings;
 - .3 Diffusers, registers and terminal units;
 - .4 Dampers and controls;
 - .5 Terminal air units.

1.3 ADMINISTRATIVE REQUIREMENTS

- .1 Site Evaluation: conduct site visit 2 weeks before start of work to establish specific coordinated and cleaning plan to establish cleaning plan determining how areas of facility and HVAC systems will be protected during cleaning operations.
 - .1 Ensure plan identifies sequence and schedule of survey and cleaning operations for each individual HVAC system and for complete facility.
 - .1 Take account of elbows, bends, turning vanes, dampers, transitions, take-offs,
 - .2 Departmental Representative to review video survey and cleaning plan 1 week minimum prior to start of work.
 - .1 Proceed with cleaning work only after receiving written approval from Departmental Representative .
- .2 Scheduling: Hours of Operation: complete work during non-business hours as follows:
 - .1 Monday to Thursday between 18:00 hours and 07:00 hours.
 - .2 Friday from 18:00 h to Monday at 07:00 h.
 - .3 Work may be carried out during statutory holidays where permitted by Departmental Representative.
 - .4 Hours of operation are subject to change with 12 hours' notice.
- .3 Project Co-ordination: assign Project Coordinator to oversee air duct cleaning processes.
 - .1 Provide Departmental Representative with contact information of Project Coordinator including: name, telephone number, and cell phone number .
- .4 Security: DCC Representative Departmental Representative will pay costs and provide security escort at times requested on Contractor's submitted work schedule.

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- .1 Cancellation of security escort requires 72 hours minimum written notice.
 - .2 Failure to cancel security escort requirements 72 hours minimum before scheduled event will result in Contractor paying for security costs.
 - .5 Damaged or broken equipment and components found during initial testing and inspection will be repaired or replaced by Departmental Representative.

1.4 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Provide submittals in accordance with Section 01 33 00- Submittal Procedures .
- .2 Submit cleaning plan developed during site evaluation.
- .3 Product Data:
 - .1 Submit manufacturer's printed product literature and data sheets for antimicrobial agents and include product characteristics, performance criteria and limitations.
 - .2 Provide two copies of WHMIS MSDS in accordance with Section 01 35 43- Environmental Procedures 01 35 29.06- Health and Safety Requirements for antimicrobial agents or coatings.
- .4 Submit verification of delivery of hazardous or toxic waste materials to contaminated waste facility, as described in PART 3 - CLEANING - Waste Management.

1.5 CLOSEOUT SUBMITTALS

- .1 Provide submittals in accordance with Section 01 78 00- Closeout Submittals .
- .2 Post Cleaning Inspection Report: submit 4 copies of Final Inspection Report, including data collected, observations and recommendations as well as following information:
 - .1 Name and address of facility;
 - .2 Name and address of HVAC cleaning contractor;
 - .3 Description of HVAC systems with drawings identifying systems cleaned;

1.6 QUALITY ASSURANCE

- .1 Contractor: verification of membership in NADCA verification of 5 years minimum experience in work similar to or exceeding work of this Section .

Part 2 Products

2.1 ACCESS DOORS AND PANELS

- .1 Equipment Access Doors and Panels: construct from same materials as equipment paneling complete with sealing gasket and positive locking device.
 - .1 Size access doors and panels in equipment to allow for inspection and cleaning.
- .2 Ductwork Access Doors: construct access doors from 1.27 mm minimum galvanized sheet steel with gasketed seal.

-
- .1 Ensure access door is 25 mm greater in every dimension than access opening.
 - .2 Access door size 200 mm x 200 mm minimum.
 - .3 Secure access doors with cam lock fittings.
 - .3 Access Doors and Panels Acoustic Lining:
 - .1 Install acoustic lining to match existing.
 - .2 Self-adhesive glass fibre tape capable of adhering to both acoustic lining and metal access door or panel materials.
 - .3 Water-based duct sealer for repairing cut acoustic lining.
- 2.2 ANTIMICROBIAL AGENT**
- .1 Use antimicrobial agents registered with US EPA-40 CFR.
- 2.3 AIR DUCT CLEANING EQUIPMENT**
- .1 Manually propelled full contact brushes:
 - .1 Ensure brushes are specifically manufactured and shaped to fit individual ducts, equipment and components of HVAC system.
 - .1 Ensure brushes are sized to fit various duct sizes in HVAC system.
 - .2 Ensure brushes make scrubbing motion and full contact with HVAC system interior surfaces to be cleaned.
 - .2 Brushes: manually propelled with integrally-mounted motor and or other non-metallic material nylon, or polypropylene bristles.
 - .1 Ensure motor has capacity to continue to push brush after bristles are distorted.
 - .2 Replace worn and ineffective brushes when required.
- 2.4 MULTI-FUNCTIONAL ROBOTIC CLEANING SYSTEM**
- .1 Self-propelled remote controlled, track or wheeled drive equipped with: camera halogen lights: brushes:
 - .1 Ensure brushes are specifically manufactured and shaped to fit acoustic lined ducts and individual ducts, equipment and components of HVAC system.
 - .2 Ensure brushes make scrubbing motion and full contact with HVAC system interior surfaces.
 - .3 Replace worn and ineffective brushes when required.
- 2.5 HEPA FILTER EVACUATION FAN**
- .1 Evacuation Fan: includes fan, HEPA filter, flexible hose and motor capable of maintaining debris and particulates airborne in airstream until they reach evacuation fan and maintaining system under negative pressure.
 - .1 Ensure HEPA filters are clean and maintain evacuation fan and HEPA filter to run efficiently.

2.6 HEPA VACUUM UNIT

- .1 Vacuum Unit: includes vacuum fan, integral HEPA filter, suction hose and vacuum head, capable of maintaining HVAC System debris and particulates airborne in air stream until they reach vacuum unit and maintaining system under negative pressure.
 - .1 Ensure HEPA filters are clean and maintain vacuum unit and HEPA filter to run efficiently.

Part 3 Execution

3.1 PREPARATION

- .1 Close down HVAC system.
- .2 Locate and identify externally visible HVAC system features which may affect cleaning process including:
 - .1 Control devices;
 - .2 Fire dampers;
 - .3 Balancing dampers: indicate and record positions for resetting;
 - .4 Air volume control boxes: indicate and record positions for resetting;
 - .5 Fire alarm devices;
 - .6 Monitoring devices and controls;
- .3 Cut openings in equipment panels and ductwork for access to system interior.
 - .1 Square or rectangular opening sizes: 200 mm minimum each side.
 - .2 Circular opening sizes: 200 mm minimum diameter.
- .4 Installation of Access Doors and Panels: install access doors and panels for equipment where required instructed by DCC Representative Departmental Representative to facilitate system inspection and cleaning.
 - .1 Install access doors and panels for inspection and cleaning of equipment as follows:
 - .1 Heating and cooling coils;
 - .2 Fan units;
 - .3 Filters;
 - .4 Dampers;
 - .5 Sensors;
 - .6 Air monitoring stations.
- .5 Installation of Access Doors in Ductwork: install access doors in ductwork where required instructed by Departmental Representative to facilitate system inspection and cleaning.
 - .1 Access door installation is not permitted in flexible ductwork.

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- .1 Inspect flexible ductwork only by disconnecting from main duct and inspecting from open end.
 - .6 When acoustically lined duct is cut for access, repair cut edges of acoustic lining using self-adhesive fibre glass tape and water based duct sealer.
 - .1 Adhere new acoustic lining to match existing to inside of access panel or door to ensure continuity of acoustic properties of system.
 - .7 Remove and reinstall ceiling tiles to gain access to HVAC system as required.
 - .1 Replace ceiling tiles damaged or soiled by air duct cleaning procedures.

3.2 EXAMINATION / PRE-CLEANING INSPECTION

- .1 Verification of Conditions:
 - .1 Make visual inspection of interior of HVAC system using remote controlled robotic camera.
- .2 Evaluation and Assessment:
 - .1 Identify location and type of internal components.
 - .2 Identify extent of potential problems.

3.3 DUCT CLEANING

- .1 Do duct cleaning in accordance with NADCA ACR Standard.
- .2 Isolate and clean sections in zones to ensure that dirt deposits and debris from zone being cleaned does not pass through another zones which has already been cleaned.
 - .1 Isolate zone of duct using closed-cell polyurethane foam air inflated zone bag before cleaning.
- .3 Ensure vacuum units and evacuation fans are securely in place before starting cleaning operation of isolated section of HVAC air duct system.
- .4 Install HEPA filter evacuation fan at one end of zone section and insert full contact brushes at other end.
- .5 Energize brushes to travel from insertion point to HEPA filter evacuation fan.
 - .1 Pass brushes through sections as often as necessary to achieve required cleanliness.
 - .2 Change brush sizes as required to ensure positive contact with duct and component interiors.
 - .3 Clean corners and pockets where dirt and debris can accumulate.
- .6 Clean equipment, components and other features in isolated zone before moving to next zone of HVAC air duct system.
- .7 Clean diffusers, registers, louvers, and terminal heating units (convections)
- .8 Advise Departmental Representative 72 hours minimum before deactivation of fire alarm and smoke detectors duct cleaning operations.

-
- .1 Departmental Representative will pay for costs of deactivation of fire alarm and smoke detector system.

3.4 ACOUSTICALLY LINED DUCTWORK CLEANING

- .1 Clean glass fibre acoustically insulated ducts to NAIMA recommended practices.
 - .1 Use specifically designed robotic apparatus that has been demonstrated not to damage acoustic glass fibre lining.
 - .2 Monitor cleaning process progress by onboard camera.

3.5 COMPONENTS AND EQUIPMENT CLEANING

- .1 Brush and vacuum coils, humidifiers, air handling unit enclosures.
- .2 Proceed to next section in cleaning sequence only after written approval from Departmental Representative .
- .3 Compressed air and manual cleaning is acceptable only for cleaning individual components and small areas as follows and only after written approval from Departmental Representative :
 - .1 Fan blades;
 - .2 Dampers;
 - .3 Turning vanes;
 - .4 Controls;
 - .5 Sensor bulbs;
 - .6 Fire alarms;
 - .7 Smoke detectors;
 - .8 Terminal heating units.

3.6 FIELD QUALITY CONTROL/FINAL INSPECTIONS

- .1 Post Cleaning Inspection: carry out final inspection using robotic camera and other visual inspection methods after final cleaning has been completed.
 - .1 Identify on HVAC system record drawings access points used for inspection and cleaning.
 - .2 Reset components including dampers and sensors, which have been disturbed during cleaning operations.

3.7 SYSTEM STARTUP

- .1 Install new system filters after cleaning operations are completed.
- .2 Cover each inspection opening with access door or panel and secure in place after inspection and cleaning are completed.
- .3 Restart each HVAC system.

3.8 CLEANING

- .1 Clean in accordance with Section 01 74 00- Cleaning .

END OF SECTION

Part 1 General

1.1 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Submit in accordance with Section 01 33 00- Submittal Procedures.
- .2 Product Data:
 - .1 Submit manufacturer's instructions, printed product literature and data sheets for all equipment.
- .3 Shop Drawings:
 - .1 Submit drawings stamped and signed by professional engineer registered or licensed in the Province of Manitoba.
 - .2 Indicate on drawings:
 - .1 Mounting arrangements.
 - .2 Operating and maintenance clearances.
 - .3 Shop drawings and product data accompanied by:
 - .1 Detailed drawings of bases, supports, and anchor bolts.
 - .2 Acoustical sound power data, where applicable.
 - .3 Points of operation on performance curves.
 - .4 Manufacturer to certify current model production.
 - .5 Certification of compliance to applicable codes.
 - .4 In addition to transmittal letter referred to in Section 01 33 00- Submittal Procedures: use MCAC "Shop Drawing Submittal Title Sheet". Identify section and paragraph number.
 - .5 All changes required to larger, smaller, heavier, different electrical characteristics, and different connection requirements shall be paid for by the contractor.

1.2 CLOSEOUT SUBMITTALS

- .1 Submit in accordance with Section 01 78 00- Closeout Submittals.
- .2 Operation and Maintenance Data: submit operation and maintenance data for:
 - .1 Operation and maintenance manual approved by, and final copies deposited with Departmental Representative before final inspection.
 - .2 Operation data to include:
 - .1 Control schematics for systems including environmental controls.
 - .2 Description of systems and their controls.
 - .3 Description of operation of systems at various loads together with reset schedules and seasonal variances.
 - .4 Operation instruction for systems and component.

-
- .5 Description of actions to be taken in event of equipment failure.
 - .6 Valves schedule and flow diagram.
 - .7 Colour coding chart.
 - .3 Maintenance data to include:
 - .1 Servicing, maintenance, operation and trouble-shooting instructions for each item of equipment.
 - .2 Data to include schedules of tasks, frequency, tools required and task time.
 - .4 Performance data to include:
 - .1 Equipment manufacturer's performance datasheets with point of operation as left after commissioning is complete.
 - .2 Equipment performance verification test results.
 - .3 Special performance data as specified.
 - .4 Testing, adjusting and balancing reports as specified in Section 23 05 93- Testing, Adjusting and Balancing for HVAC.
 - .5 Approvals:
 - .1 Submit 2 copies of draft Operation and Maintenance Manual to Departmental Representative for approval. Submission of individual data will not be accepted unless directed by Departmental Representative.
 - .2 Make changes as required and re-submit as directed by Departmental Representative.
 - .6 Additional data:
 - .1 Prepare and insert into operation and maintenance manual additional data when need for it becomes apparent during specified demonstrations and instructions.
 - .7 Site records:
 - .1 Departmental Representative will provide 1 set of reproducible mechanical drawings. Provide sets of white prints as required for each phase of work. Mark changes as work progresses and as changes occur. Include changes to existing mechanical systems, control systems and low voltage control wiring .
 - .2 Transfer information weekly to reproducibles, revising reproducibles to show work as actually installed.
 - .3 Use different colour waterproof ink for each service.
 - .4 Make available for reference purposes and inspection.
 - .8 As-built drawings:
 - .1 Prior to start of Testing, Adjusting and Balancing for HVAC, finalize production of as-built drawings.

- .2 Identify each drawing in lower right hand corner in letters at least 12 mm high as follows: - "AS BUILT DRAWINGS: THIS DRAWING HAS BEEN REVISED TO SHOW MECHANICAL SYSTEMS AS INSTALLED" (Signature of Contractor) (Date).
- .3 Submit to Departmental Representative for approval and make corrections as directed.
- .4 Perform testing, adjusting and balancing for HVAC using as-built drawings.
- .5 Submit completed reproducible as-built drawings with Operating and Maintenance Manuals.
- .9 Submit copies of as-built drawings for inclusion in final TAB report.

1.3 MAINTENANCE MATERIAL SUBMITTALS

- .1 Submit in accordance with Section 01 78 00- Closeout Submittals.
- .2 Provide one set of special tools required to service equipment as recommended by manufacturers.

1.4 DELIVERY, STORAGE AND HANDLING

- .1 Deliver, store and handle materials in accordance with Section with manufacturer's written instructions 01 61 00- Common Product Requirements.
- .2 Delivery and Acceptance Requirements: deliver materials to site in original factory packaging, labelled with manufacturer's name and address.
- .3 Storage and Handling Requirements:
 - .1 Store materials indoors off ground in dry location and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.
 - .2 Store and protect from nicks, scratches, and blemishes
 - .3 Replace defective or damaged materials with new.
- .4 Packaging Waste Management: remove for reuse and return by manufacturer of packaging materials padding, pallets, crates, as specified in Construction Waste Management Plan Waste Reduction Workplan in accordance with Section 01 74 19- Waste Management and Disposal .

Part 2 Products

2.1 NOT USED

Part 3 Execution

3.1 PAINTING REPAIRS AND RESTORATION

- .1 Do painting in accordance with Section 09 91 23- Interior Painting.
- .2 Prime and touch up marred finished paintwork to match original.
- .3 Restore to new condition, finishes which have been damaged.

3.2 SYSTEM CLEANING

- .1 Clean interior and exterior of all systems including strainers. Vacuum interior of ductwork.

3.3 DEMONSTRATION

- .1 Departmental Representative will use equipment and systems for test purposes prior to acceptance. Supply labour, material, and instruments required for testing.
- .2 Trial usage to apply to following equipment and systems:
 - .1 VAV terminal units;
 - .2 Fans;
 - .3 Terminal heating units;
 - .4 Controls.
- .3 Supply tools, equipment and personnel to demonstrate and instruct operating and maintenance personnel in operating, controlling, adjusting, trouble-shooting and servicing of all systems and equipment during regular work hours, prior to acceptance.
- .4 Use operation and maintenance manual, as-built drawings, and audio visual aids as part of instruction materials.
- .5 Instruction duration time requirements as specified in appropriate sections.
- .6 Departmental Representative will record these demonstrations on video tape for future reference.

3.4 CLEANING

- .1 Progress Cleaning: clean in accordance with Section 01 74 00- Cleaning.
 - .1 Leave Work area clean at end of each day.
- .2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 74 00- Cleaning.

3.5 PROTECTION

- .1 Protect equipment and systems openings from dirt, dust, and other foreign materials with materials appropriate to system.

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 REFERENCE STANDARDS

- .1 American Society of Heating, Refrigeration and Air-Conditioning Engineers (ASHRAE)
 - .1 ASHRAE 90.1-16, 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 01 33 00- Submittal Procedures.
- .2 Product Data:
 - .1 Submit manufacturer's printed product literature, specifications and datasheet in accordance with Section 01 33 00- Submittal Procedures. Include product characteristics, performance criteria, and limitations.
 - .1 Submit two copies of Workplace Hazardous Materials Information System (WHMIS) Material Safety Data Sheets (MSDS) in accordance with Section 01 33 00- Submittal Procedures.
- .3 Quality Control: in accordance with Section 01 45 00- Quality Control.
 - .1 Certificates: submit certificates signed by manufacturer certifying that materials comply with specified performance characteristics and physical properties.
- .4 Closeout Submittals

- .1 Provide maintenance data for motors, drives and guards for incorporation into manual specified in Section 01 78 00- Closeout Submittals.

1.4 QUALITY ASSURANCE

- .1 Regulatory Requirements: work to be performed in compliance with applicable Provincial.
- .2 Health and Safety Requirements: do construction occupational health and safety in accordance with Section 01 35 29.06- Health and Safety Requirements.

1.5 DELIVERY, STORAGE, AND HANDLING

- .1 Packing, shipping, handling and unloading:
 - .1 Deliver, store and handle in accordance with Section 01 61 00- Common Product Requirements.
 - .2 Deliver, store and handle materials in accordance with manufacturer's written instructions.
- .2 Waste Management and Disposal:
 - .1 Waste Management and Disposal: separate waste materials for recycling reuse in accordance with Section 01 74 19- Waste Management and Disposal.

Part 2 Products

2.1 GENERAL

- .1 Motors: high efficiency, in accordance with Manitoba Hydro standards and to ASHRAE 90.1.

2.2 MOTORS

- .1 Provide motors for mechanical equipment as specified.
- .2 Motors 373 W 1/2 HP and under : speed as indicated, continuous duty, built-in overload protection, resilient mount, single phase, 120 V, unless otherwise specified or indicated.
- .3 Motors over 373 W 1/2 HP: EEMAC Class B, squirrel cage induction, speed as indicated, continuous duty, drip proof, ball bearing, maximum temperature rise 40 degrees C, 3 phase.

2.3 TEMPORARY MOTORS

- .1 If delivery of specified motor will delay completion or commissioning work, install motor approved by Departmental Representative 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 (7.5 kW) : standard adjustable pitch drive sheaves, having plus or minus 10% range. Use mid-position of range for specified r/min.
- .4 Correct size of sheave determined during commissioning.
- .5 Minimum drive rating: 1.5 times nameplate rating on motor. Keep overhung loads within manufacturer's design requirements on prime mover shafts.
- .6 Motor slide rail adjustment plates to allow for centre line adjustment.
- .7 Supply one set of spare belts for each set installed in accordance with Section 01 78 00- Closeout Submittals.

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 1.2 mm thick sheet metal tops and bottoms.
 - .3 38 mm dia 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, 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.

3.3 CLEANING

- .1 Proceed in accordance with Section 01 74 00- Cleaning.
- .2 Upon completion and verification of performance of installation, remove surplus materials, excess materials, rubbish, tools and equipment.

END OF SECTION

Part 1 General**1.1 REFERENCE STANDARDS**

- .1 American Society of Mechanical Engineers (ASME)
 - .1 ASME B31.1-07, Power Piping.
- .2 ASTM International (ASTM)
 - .1 ASTM A307-07b, Standard Specification for Carbon Steel Bolts and Studs, 60,000 PSI Tensile Strength.
 - .2 ASTM A563-07a, Standard Specification for Carbon and Alloy Steel Nuts.
- .3 Manufacturer's Standardization Society of the Valves and Fittings Industry (MSS)
 - .1 MSS SP58-2002, Pipe Hangers and Supports - Materials, Design and Manufacture.
 - .2 MSS SP69-2003, Pipe Hangers and Supports - Selection and Application.
- .4 National Research Council Canada (NRC)
 - .1 Manitoba Plumbing Code of Canada 2010 (MPC).
- .5 Underwriter's Laboratories of Canada (ULC)

1.2 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Provide submittals in accordance with Section 01 33 00- Submittal Procedures.
- .2 Product Data:
 - .1 Provide manufacturer's printed product literature and data sheets for hangers and supports and include product characteristics, performance criteria, physical size, finish and limitations.
- .3 Certificates:
 - .1 Submit certificates signed by manufacturer certifying that materials comply with specified performance characteristics and physical properties.
- .4 Manufacturers' Instructions:
 - .1 Provide manufacturer's installation instructions.
 - .1 Departmental Representative will make available 1 copy of systems supplier's installation instructions.

1.3 CLOSEOUT SUBMITTALS

- .1 Provide maintenance data for incorporation into manual specified in Section 01 78 00- Closeout Submittals.

1.4 DELIVERY, STORAGE AND HANDLING

- .1 Deliver, store and handle materials in accordance with Section with manufacturer's written instructions 01 61 00- Common Product Requirements.
- .2 Delivery and Acceptance Requirements:
 - .1 Deliver materials to site in original factory packaging, labelled with manufacturer's name, address.
- .3 Packaging Waste Management: remove for reuse and return by manufacturer of packaging materials crates, pallets, padding, in accordance with Section 01 74 19- Waste Management and Disposal.

Part 2 Products**2.1 SYSTEM DESCRIPTION**

- .1 Design Requirements:
 - .1 Construct pipe hanger and support to manufacturer's recommendations utilizing manufacturer's regular production components, parts and assemblies.
 - .2 Base maximum load ratings on allowable stresses prescribed by ASME B31.1 or MSS SP58.
 - .3 Ensure that supports, guides, anchors do not transmit excessive quantities of heat to building structure.
 - .4 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.
 - .5 Provide for vertical adjustments after erection and during commissioning. Amount of adjustment in accordance with MSS SP58.

2.2 GENERAL

- .1 Fabricate hangers, supports and sway braces in accordance with MSS SP58. ANSI B31.1 and
- .2 Use components for intended design purpose only. Do not use for rigging or erection purposes.

2.3 PIPE HANGERS

- .1 Finishes:
 - .1 Pipe hangers and supports: painted with zinc-rich paint galvanized after manufacture.
 - .2 Use hot dipped galvanizing process.
 - .3 Ensure steel hangers in contact with copper piping are copper plated.

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- .2 Upper attachment structural: suspension from lower flange of I-Beam:
 - .1 Cold piping NPS 2 maximum: malleable iron C-clamp with hardened steel cup point setscrew, locknut carbon steel retaining clip.
 - .1 Rod: 9 mm UL listed.
 - .3 Upper attachment structural: suspension from upper flange of I-Beam:
 - .4 Upper attachment to concrete:
 - .1 Ceiling: carbon steel welded eye rod, clevis plate, clevis pin and cotters with weldless forged steel eye nut. Ensure eye 6 mm minimum greater than rod diameter.
 - .2 Concrete inserts: wedge shaped body with knockout protector plate UL listed to MSS SP69.
 - .5 Shop and field-fabricated assemblies:
 - .1 Trapeze hanger assemblies:
 - .2 Steel brackets:
 - .6 Hanger rods: threaded rod material to MSS SP58:
 - .1 Ensure that hanger rods are subject to tensile loading only.
 - .2 Provide linkages where lateral or axial movement of pipework is anticipated.
 - .3 Do not use 22 mm or 28 mm rod.
 - .7 Pipe attachments: material to MSS SP58:
 - .1 Attachments for steel piping: carbon steel black galvanized.
 - .2 Attachments for copper piping: copper plated black steel.
 - .3 Use insulation shields for hot pipework.
 - .4 Oversize pipe hangers and supports.
 - .8 Adjustable clevis: material to MSS SP69 UL listed FM approved, clevis bolt with nipple spacer and vertical adjustment nuts above and below clevis.
 - .1 Ensure "U" has hole in bottom for rivetting to insulation shields.

2.4 RISER CLAMPS

- .1 Steel or cast iron pipe: galvanized black carbon steel to MSS SP58, type 42, UL listed FM approved.
- .2 Copper pipe: carbon steel copper plated to MSS SP58, type 42.
- .3 Bolts: to ASTM A307.
- .4 Nuts: to ASTM A563.

2.5 INSULATION PROTECTION SHIELDS

- .1 Insulated cold piping:
 - .1 64 kg/m³ density insulation plus insulation protection shield to: MSS SP69, galvanized sheet carbon steel. Length designed for maximum 3 m span.
- .2 Insulated hot piping:
 - .1 Curved plate 300 mm long, with edges turned up, welded-in centre plate for pipe sizes NPS 12 and over, carbon steel to comply with MSS SP69.

2.6 OTHER EQUIPMENT SUPPORTS

- .1 Fabricate equipment supports from structural grade steel meeting requirements of Section 05 12 23- Structural Steel for Buildings.
- .2 Submit structural calculations with shop drawings.

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:
 - .1 Manufacturer's instructions and recommendations.
- .2 Vibration Control Devices:
 - .1 Install on piping systems at pumps, boilers, chillers, cooling towers, and as indicated.
- .3 Clamps on riser piping:
 - .1 Support independent of connected horizontal pipework using riser clamps and riser clamp lugs welded to riser.
 - .2 Bolt-tightening torques to industry standards.
 - .3 Steel pipes: install below coupling or shear lugs welded to pipe.
 - .4 Cast iron pipes: install below joint.
- .4 Clevis plates:
 - .1 Attach to concrete with 4 minimum concrete inserts, one at each corner.
- .5 Provide supplementary structural steelwork where structural bearings do not exist or where concrete inserts are not in correct locations.

- .6 Use approved constant support type hangers where:
 - .1 Vertical movement of pipework is 13 mm or more,
 - .2 Transfer of load to adjacent hangers or connected equipment is not permitted.
- .7 Use variable support spring hangers where:
 - .1 Transfer of load to adjacent piping or to connected equipment is not critical.
 - .2 Variation in supporting effect does not exceed 25 % of total load.

3.3 HANGER SPACING

- .1 Plumbing piping: to Manitoba Code authority having jurisdiction.
- .2 Fire protection: to applicable fire code.
- .3 Copper piping: up to NPS 1/2: every 1.5 m.
- .4 Flexible joint roll groove pipe: in accordance with table below for steel, but not less than one hanger at joints. Table listings for straight runs without concentrated loads and where full linear movement is not required.
- .5 Within 300 mm of each elbow.

Maximum Pipe Size : NPS	Maximum Spacing Steel	Maximum Spacing Copper
up to 1-1/4	2.4 m	1.8 m
1-1/2	3.0 m	2.4 m
2	3.0 m	2.4 m
2-1/2	3.7 m	3.0 m
3	3.7 m	3.0 m
3-1/2	3.7 m	3.3 m

3.4 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.

3.5 HORIZONTAL MOVEMENT

- .1 Angularity of rod hanger resulting from horizontal movement of pipework from cold to hot position not to exceed 4 degrees from vertical.
- .2 Where horizontal pipe movement is less than 13 mm, offset pipe hanger and support so that rod hanger is vertical in the hot position.

3.6 FINAL ADJUSTMENT

- .1 Adjust hangers and supports:

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- .1 Ensure that rod is vertical under operating conditions.
 - .2 Equalize loads.
 - .2 Adjustable clevis:
 - .1 Tighten hanger load nut securely to ensure proper hanger performance.
 - .2 Tighten upper nut after adjustment.
 - .3 C-clamps:
 - .1 Follow manufacturer's recommended written instructions and torque values when tightening C-clamps to bottom flange of beam.
 - .4 Beam clamps:
 - .1 Hammer jaw firmly against underside of beam.

3.7 CLEANING

- .1 Clean in accordance with Section 01 74 00- Cleaning .
 - .1 Remove surplus materials, excess materials, rubbish, tools and equipment.
- .2 Waste Management: separate waste materials for recycling reuse in accordance with Section 01 74 19- Waste Management and Disposal .

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 REFERENCE STANDARDS

- .1 Canadian General Standards Board (CGSB)
 - .1 CAN/CGSB-24.3-92 , Identification of Piping Systems.
- .2 National Fire Protection Association (NFPA)
 - .1 NFPA 13-2019 , Standard for the Installation of Sprinkler Systems.
 - .2 NFPA 14-2016 , Standard for the Installation of Standpipe and Hose Systems.

1.3 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Product Data:
- .2 Submittals: in accordance with Section 01 33 00- Submittal Procedures.
- .3 Product data to include paint colour chips, other products specified in this section.
- .4 Samples:
 - .1 Submit samples in accordance with Section 01 33 00- Submittal Procedures.
 - .2 Samples to include nameplates, labels, tags, lists of proposed legends.

1.4 QUALITY ASSURANCE

- .1 Quality assurance submittals: submit following in accordance with Section 01 33 00- Submittal Procedures.
- .2 Health and Safety:
 - .1 Do construction occupational health and safety in accordance with Section 01 35 29.06- Health and Safety Requirements.

1.5 DELIVERY, STORAGE, AND HANDLING

- .1 Packing, shipping, handling and unloading:
 - .1 Deliver, store and handle in accordance with Section 01 61 00- Common Product Requirements.

- .2 Deliver, store and handle materials in accordance with manufacturer's written instructions.
- .2 Waste Management and Disposal:
 - .1 Waste Management and Disposal: separate waste materials for reuse recycling in accordance with Section 01 74 19- Waste Management and Disposal.
 - .2 Dispose of unused coating paint material at official hazardous material collections site approved by Departmental Representative
 - .3 Do not dispose of unused paint coating material into sewer system, into streams, lakes, onto ground or in locations where it will pose health or environmental hazard.

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 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 200	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 .

.5 Identification for PSPC Preventive Maintenance Support System (PMSS):

.1 Use arrangement of Main identifier, Source identifier, Destination identifier.

.2 Equipment in Mechanical Room:

.1 Main identifier: size #9.

.2 Source and Destination identifiers: size #6.

.3 Terminal cabinets, control panels: size #5.

.3 Equipment elsewhere: sizes as appropriate.

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 Departmental Representative.

2.4 PIPING SYSTEMS GOVERNED BY CODES

.1 Identification:

.1 Sprinklers: to NFPA 13.

.2 Standpipe and hose systems: to NFPA 14.

2.5 IDENTIFICATION DUCTWORK SYSTEMS

.1 50 mm high stencilled letters and directional arrows 150 mm long x 50 mm high.

.2 Colours: back, or co-ordinated with base colour to ensure strong contrast.

2.6 VALVES, CONTROLLERS

.1 Brass tags with 12 mm stamped identification data filled with black paint.

.2 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 specified Section 09 91 23- Interior Painting has been completed.

3.3 INSTALLATION

- .1 Perform work in accordance with CAN/CGSB-24.3 except as specified otherwise.
- .2 Identify systems, equipment to conform to PWGSC PMSS.

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 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.

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- .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.

3.6 VALVES, CONTROLLERS

- .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 Install one copy of flow diagrams, valve schedules mounted in frame behind non-glare glass where directed by Departmental Representative . Provide one copy (reduced in size if required) in each operating and maintenance manual.
- .3 Number valves in each system consecutively.

3.7 CLEANING

- .1 Proceed in accordance with Section 01 74 00- Cleaning .
- .2 Upon completion and verification of performance of installation, remove surplus materials, excess materials, rubbish, tools and equipment.

END OF SECTION

Part 1 General**1.1 SUMMARY**

- .1 TAB is used throughout this Section to describe the process, methods and requirements of testing, adjusting and balancing for HVAC.
- .2 TAB means to test, adjust and balance to perform in accordance with requirements of Contract Documents and to do other work as specified in this section.

1.2 QUALIFICATIONS OF TAB PERSONNEL

- .1 Submit names of personnel to perform TAB to Departmental Representative within 90 days of award of contract.
- .2 Provide documentation confirming qualifications, successful experience.
- .3 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, MN-1-2002.
- .4 Recommendations and suggested practices contained in the TAB Standard: mandatory.
- .5 Use TAB Standard provisions, including checklists, and report forms to satisfy Contract requirements.
- .6 Use TAB Standard for TAB, including qualifications for TAB Firm and Specialist and calibration of TAB instruments.
- .7 Where instrument manufacturer calibration recommendations are more stringent than those listed in TAB Standard, use manufacturer's recommendations.
- .8 TAB Standard quality assurance provisions such as performance guarantees form part of this contract.
 - .1 For systems or system components not covered in TAB Standard, use TAB procedures developed by TAB Specialist.
 - .2 Where new procedures, and requirements, are applicable to Contract requirements have been published or adopted by body responsible for TAB Standard used (AABC, NEBB, or TABB), requirements and recommendations contained in these procedures and requirements are mandatory.

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 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 load requirements over full operating ranges.

1.4 EXCEPTIONS

- .1 TAB of systems and equipment regulated by codes, standards to satisfaction of authority having jurisdiction.

1.5 CO-ORDINATION

- .1 Schedule time required for TAB (including repairs, re-testing) into project construction and completion schedule 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.

1.6 PRE-TAB REVIEW

- .1 Review Contract Documents before project construction is started confirm in writing to Departmental Representative adequacy of provisions for TAB and other aspects of design and installation pertinent to success of TAB.
- .2 Review specified standards and report to Departmental Representative in writing proposed procedures which vary from standard.
- .3 During construction, co-ordinate location and installation of TAB devices, equipment, accessories, measurement ports and fittings.

1.7 START-UP

- .1 Follow start-up procedures as recommended by equipment manufacturer unless specified otherwise.
- .2 Follow special start-up procedures specified elsewhere in Division 23.

1.8 OPERATION OF SYSTEMS DURING TAB

- .1 Operate systems for length of time required for TAB and as required by Departmental Representative for verification of TAB reports.

1.9 START OF TAB

- .1 Notify Departmental Representative 7 days prior to start of TAB.
- .2 Start TAB when building is essentially completed, including:
- .3 Installation of ceilings, doors, windows, other construction affecting TAB.
- .4 Application of weatherstripping, sealing, and caulking.

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- .5 Pressure, leakage, other tests specified elsewhere Division 23.
 - .6 Provisions for TAB installed and operational.
 - .7 Start-up, verification for proper, normal and safe operation of 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 Duct systems clean.
 - .2 Ducts, ceiling plenums are airtight to within specified tolerances.
 - .3 Fire, smoke, volume control dampers installed and open.
 - .4 Coil fins combed, clean.
 - .5 Access doors, installed, closed.
 - .6 Outlets installed, volume control dampers open.
 - .3 Liquid systems:
 - .1 Flushed, filled, vented.
 - .2 Strainers in place, baskets clean.
 - .3 Isolating and balancing valves installed, open.
 - .4 Calibrated balancing valves installed, at factory settings.
 - .5 Chemical treatment systems complete, operational.

1.10 APPLICATION TOLERANCES

- .1 Do TAB to following tolerances of design values:
 - .1 HVAC systems: plus 5 %, minus 5 %.
 - .2 Hydronic systems: plus or minus 10 %.

1.11 ACCURACY TOLERANCES

- .1 Measured values accurate to within plus or minus 2 % of actual values.

1.12 INSTRUMENTS

- .1 Prior to TAB, submit to Departmental Representative list of instruments used together with serial numbers.
- .2 Calibrate in accordance with requirements of most stringent of referenced standard for either applicable system or HVAC system.
- .3 Calibrate within 3 months of TAB. Provide certificate of calibration to Departmental Representative .

1.13 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Submit, prior to commencement of TAB:

- .2 Proposed methodology and procedures for performing TAB if different from referenced standard.

1.14 PRELIMINARY TAB REPORT

- .1 Submit for checking and approval of Departmental Representative , prior to submission of formal TAB report, sample of rough TAB sheets. Include:
 - .1 Details of instruments used.
 - .2 Details of TAB procedures employed.
 - .3 Calculations procedures.
 - .4 Summaries.

1.15 TAB REPORT

- .1 Format in accordance with referenced standard .
- .2 TAB report to show results in SI units and to include:
 - .1 Project record drawings.
 - .2 System schematics.
- .3 Submit 6 copies of TAB Report to Departmental Representative for verification and approval, in English in D-ring binders, complete with index tabs.

1.16 VERIFICATION

- .1 Reported results subject to verification by Departmental Representative.
- .2 Provide personnel and instrumentation to verify up to 30 % of reported results.
- .3 Number and location of verified results as directed by Departmental Representative .
- .4 Pay costs to repeat TAB as required to satisfaction of Departmental Representative .

1.17 SETTINGS

- .1 After TAB is completed to satisfaction of Departmental Representative , replace drive guards, close access doors, lock devices in set positions, ensure sensors are at required settings.
- .2 Permanently mark settings to allow restoration at any time during life of facility. Do not eradicate or cover markings.

1.18 COMPLETION OF TAB

- .1 TAB considered complete when final TAB Report received and approved by Departmental Representative.

1.19 AIR SYSTEMS

- .1 Standard: TAB to most stringent of this section TAB standards of SMACNA AABC

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- .2 Qualifications: personnel performing TAB qualified to standards of AABC current member in good standing of AABC .
 - .3 Quality assurance: perform TAB under direction of supervisor qualified by AABC .
 - .4 Measurements: to include as appropriate for systems, equipment, components, controls: air velocity, static pressure, flow rate, pressure drop (or loss), temperatures (dry bulb, wet bulb, dewpoint), duct cross-sectional area, RPM, electrical power, voltage, noise, vibration.
 - .5 Locations of equipment measurements: to include as appropriate:
 - .1 Inlet and outlet of dampers, filter, coil, humidifier, fan, other equipment causing changes in conditions.
 - .2 At controllers, controlled device.
 - .6 Locations of systems measurements to include as appropriate: main ducts, main branch, sub-branch, run-out (or grille, register or diffuser).

1.20 OTHER TAB REQUIREMENTS

- .1 General requirements applicable to work specified this paragraph:
 - .1 Qualifications of TAB personnel: as for air systems specified this section.
 - .2 Quality assurance: as for air systems specified this section.

Part 2 Products**2.1 NOT USED**

- .1 Not used.

Part 3 Execution**3.1 NOT USED**

- .1 Not used.

END OF SECTION

Part 1 General

1.1 REFERENCE STANDARDS

- .1 ASTM International (ASTM)
 - .1 ASTM C335-05ae1 , Standard Test Method for Steady State Heat Transfer Properties of Pipe Insulation.
 - .2 ASTM C449/C449M-2013, Standard Specification for Mineral Fiber-Hydraulic-Setting Thermal Insulating and Finishing Cement.
 - .3 ASTM C553-02e1 , Standard Specification for Mineral Fiber Blanket Thermal Insulation for Commercial and Industrial Applications.
 - .4 ASTM C612-04e1 , Standard Specification for Mineral Fiber Block and Board Thermal Insulation.
 - .5 ASTM C921-03a , Standard Practice for Determining the Properties of Jacketing Materials for Thermal Insulation.
- .2 Canadian General Standards Board (CGSB)
 - .1 CGSB 51-GP-52Ma, Vapour Barrier, Jacket and Facing Material for Pipe, Duct and Equipment Thermal Insulation.
- .3 Thermal Insulation Association of Canada (TIAC): National Insulation Standards (2005).
- .4 Underwriters Laboratories of Canada (ULC)
 - .1 CAN/ULC-S102, Method of Test for Surface Burning Characteristics of Building Materials and Assemblies.

1.2 DEFINITIONS

- .1 For purposes of this section:
 - .1 "CONCEALED" - insulated mechanical services and equipment in suspended ceilings and non-accessible chases and furred-in spaces.
 - .2 "EXPOSED" - means "not concealed" as previously defined.
 - .3 Insulation systems - insulation material, fasteners, jackets, and other accessories.
- .2 TIAC Codes:
 - .1 CRD: Code Round Ductwork,
 - .2 CRF: Code Rectangular Finish.

1.3 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Provide submittals in accordance with Section 01 33 00- Submittal Procedures .
- .2 Product Data:

- .1 Provide manufacturer's printed product literature and datasheets for duct insulation, and include product characteristics, performance criteria, physical size, finish and limitations.
 - .1 Description of equipment giving manufacturer's name, type, model, year and capacity.
 - .2 Details of operation, servicing and maintenance.
 - .3 Recommended spare parts list.
- .3 Samples:
 - .1 Where requested, submit for approval: complete assembly of each type of insulation system, insulation, coating, and adhesive proposed.
 - .2 Mount sample on 12 mm plywood board.
 - .3 Affix typewritten label beneath sample indicating service.
- .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 Deliver, store and handle in accordance with Section 01 61 00- Common Product Requirements.
- .2 Deliver materials to site in original factory packaging, labelled with manufacturer's name, address and ULC markings.
- .3 Packaging Waste Management: remove for reuse and return by manufacturer of pallets padding crates packaging materials in accordance with Section 01 74 19- Waste Management and Disposal.

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.

2.2 INSULATION

- .1 Mineral fibre: as specified includes glass fibre, rock wool, slag wool.
- .2 Thermal conductivity ("k" factor) not to exceed specified values at 24 degrees C mean temperature when tested in accordance with ASTM C335.
- .3 TIAC Code C-1: Rigid mineral fibre board to ASTM C612, with without factory applied vapour retarder jacket to CGSB 51-GP-52Ma (as scheduled in PART 3 of this Section).
- .4 TIAC Code C-2: Mineral fibre blanket to ASTM C553 faced without with factory applied vapour retarder jacket to CGSB 51-GP-52Ma (as scheduled in PART 3 of this section).
 - .1 Mineral fibre: to ASTM C553.
 - .2 Jacket: to CGSB 51-GP-52Ma.
 - .3 Maximum "k" factor: to ASTM C553.

2.3 JACKETS

- .1 Canvas:
 - .1 220 gm/m²cotton, plain weave, treated with dilute fire retardant lagging adhesive to ASTM C921.
- .2 Lagging adhesive: compatible with insulation.
 - .1 Maximum VOC limit 200 g/L .

2.4 ACCESSORIES

- .1 Vapour retarder lap adhesive:
 - .1 Water based, fire retardant type, compatible with insulation.
 - .1 Maximum VOC limit 170 200 50 g/L .
- .2 Indoor Vapour Retarder Finish:
 - .1 Vinyl emulsion type acrylic, compatible with insulation.
- .3 Insulating Cement: hydraulic setting on mineral wool, to ASTM C449.
- .4 ULC Listed Canvas Jacket:
 - .1 220 gm/m²cotton, plain weave, treated with dilute fire retardant lagging adhesive to ASTM C921 .
- .5 Tape: self-adhesive, aluminum, reinforced, 75 mm wide minimum.
- .6 Contact adhesive: quick-setting
 - .1 Maximum VOC limit 200 g/L .
- .7 Canvas adhesive: washable.
 - .1 Maximum VOC limit 200g/L .
- .8 Tie wire: 1.5 mm stainless steel.

- .9 Banding: 12 19 mm wide, 0.5 mm thick stainless steel.
- .10 Fasteners: 4 2 mm diameter pins with 35 mm square 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, witness and certify.
- .2 Ensure surfaces are clean, dry, free from foreign material.

3.3 INSTALLATION

- .1 Install in accordance with TIAC National Standards.
- .2 Apply materials in accordance with manufacturer's instructions and as indicated.
- .3 Use 2 layers with staggered joints when required nominal thickness exceeds 75 mm.
- .4 Maintain uninterrupted continuity and integrity of vapour retarder jacket and finishes.
 - .1 Ensure hangers, and supports are outside vapour retarder jacket.
- .5 Hangers and supports in accordance with Section 23 05 29- Hangers and Supports for HVAC Piping and Equipment .
 - .1 Apply high compressive strength insulation where insulation may be compressed by weight of ductwork.
- .6 Fasteners: install at 300 mm on centre in horizontal and vertical directions, minimum 2 rows each side.

3.5 DUCTWORK INSULATION SCHEDULE

.1 Insulation types and thicknesses: conform to following table:

TIAC Code	Vapour Retarder		Thickness (mm)
Rectangular cold and dual temperature supply air ducts	C-1	yes	50
Round cold and dual temperature supply air ducts	C-2	yes	50
Supply, return and exhaust ducts exposed in or above room being served	none		
Exhaust duct between dampers and louvres	C-1	no	25
Acoustically lined ducts	none		

.2 Exposed round ducts 600 mm and larger, smaller sizes where subject to abuse:

.1 Use TIAC code C-1 insulation, scored to suit diameter of duct.

.1 Finishes: conform to following table:

TIAC Code		
Rectangular	Round	
Indoor, concealed	none	none
Indoor, exposed	CRF/2	CRD/3

3.6 CLEANING

.1 Clean in accordance with Section 01 74 00- Cleaning .

.1 Remove surplus materials, excess materials, rubbish, tools and equipment.

.2 Waste Management: separate waste materials for reuse recycling in accordance with Section 01 74 19- Waste Management and Disposal .

END OF SECTION

Part 1 General

1.1 REFERENCE STANDARDS

- .1 American Society of Heating, Refrigerating and Air-Conditioning Engineers (ASHRAE)
- .2 ASTM International (ASTM)
 - .1 ASTM A635/A635M-09b , Standard Specification for Steel, Sheet and Strip, Heavy-Thickness Coils, Hot-Rolled, Alloy, Carbon, Structural, High-Strength Low-Alloy, and High-Strength Low-Alloy with Improved Formability, General Requirements for.
 - .2 ASTM A653/A653M-, Standard Specification for Steel Sheet, Zinc Coated (Galvanized) or Zinc-Iron Alloy Coated (Galvannealed) by the Hot-Dip Process.
- .3 Sheet Metal and Air Conditioning Contractors' National Association (SMACNA)
 - .1 SMACNA HVAC Duct Construction Standards - Metal and Flexible.
 - .2 SMACNA HVAC Air Duct Leakage Test Manual.

1.2 ACTION AND INFORMATIONAL SUBMITTALS

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

1.3 DELIVERY, STORAGE AND HANDLING

- .1 Deliver, store and handle materials in accordance with Section with manufacturer's written instructions 01 61 00- Common Product Requirements.
- .2 Delivery and Acceptance Requirements: deliver materials to site in original factory packaging, labelled with manufacturer's name and address.
- .3 Storage and Handling Requirements:
 - .1 Store materials indoors off ground in dry location and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.
 - .2 Store and protect metal ducts from nicks, scratches, and blemishes.
 - .3 Replace defective or damaged materials with new.
- .4 Develop Construction Waste Management Plan Waste Reduction Workplan related to Work of this Section.
- .5 Packaging Waste Management: remove for reuse by manufacturer and return of packaging materials crates, pallets, padding, as specified in in accordance with Section 01 74 19- Waste Management and Disposal.

Part 2 Products

2.1 SEAL CLASSIFICATION

- .1 Classification as follows:

Maximum Pressure Pa	SMACNA Seal Class
500	A
250	A
125	A

- .2 Seal classification:

- .1 Class A: longitudinal seams, transverse joints, duct wall penetrations and connections made airtight with sealant and tape.

2.2 SEALANT

- .1 Sustainability Characteristics:

- .1 Adhesives and sealants: in accordance with Section 07 92 00- Joint Sealants.
.2 Adhesives and sealants: VOC limit 250 30 70 g/L maximum to.

- .2 Sealant: oil resistant, water borne, polymer type flame resistant duct sealant.
Temperature range of minus 30 degrees C to plus 93 degrees C.

2.3 TAPE

- .1 Tape: polyvinyl treated, open weave fiberglass tape, 50 mm wide.

2.4 FITTINGS

- .1 Fabrication: to SMACNA .

- .2 Radiused elbows:

- .1 Rectangular: short radius with single thickness turning vanes standard radius
centreline radius: 1.5 times width of duct .
.2 Round: smooth radius five piece , centreline radius: 1.5 times diameter.

- .3 Mitred elbows, rectangular:

- .1 To 400 mm: with double thickness turning vanes.
.2 Over 400 mm: with double thickness turning vanes.

- .4 Branches:

- .1 Rectangular main and branch: with 45 degrees entry on branch radius on branch
1.5 times width of duct .
.2 Round main and branch: enter main duct at 45 degrees 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 degrees maximum included angle.
 - .2 Converging: 30 degrees maximum included angle.

2.5 GALVANIZED STEEL

- .1 Lock forming quality: to ASTM A653/A653M, Z90 zinc coating.
- .2 Thickness, fabrication and reinforcement: to SMACNA .
- .3 Joints: to SMACNA . .

2.6 HANGERS AND SUPPORTS

- .1 Hangers and Supports: in accordance with Section 23 05 29- Hangers and Supports for HVAC Piping and Equipment .
 - .1 COncelaed strap hangers: of same material as duct but next sheet metal thickness heavier than duct .
 - .1 Maximum size duct supported by strap hanger: 500 .
 - .2 Exposed: air craft cable, stainless steel:
 - .1 Maximum size duct supported by strap hanger: 500
 - .3 Hanger configuration: to SMACNA .
 - .4 Hangers: galvanized black steel angle with black galvanized steel rods to ASHRAE following table SMACNA :

Duct Size (mm)	Angle Size (mm)	Rod Size (mm)
501 to 750	25 x 25 x 3	6
751 to 1050	40 x 40 x 3	6
1051 to 1500	40 x 40 x 3	10
1501 to 2100	50 x 50 x 3	10

- .5 Upper hanger attachments:
 - .1 For concrete: manufactured concrete inserts.
 - .2 For steel joist: steel plate washer manufactured joist clamp .
 - .3 For steel beams: manufactured beam clamps:

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 metal duct installation in accordance with manufacturer's written instructions.
 - .1 Visually inspect substrate in presence of Departmental Representative.

- .2 Inform Departmental Representative of unacceptable conditions immediately upon discovery.
- .3 Proceed with installation only after unacceptable conditions have been remedied and after receipt of written approval to proceed from Departmental Representative .

3.2 GENERAL

- .1 Do work in accordance with ASHRAE and SMACNA .
- .2 Do not break continuity of insulation vapour barrier with hangers or rods.
 - .1 Ensure diffuser is fully seated Insulate strap hangers 100 mm beyond insulated duct .
- .3 Support risers in accordance with ASHRAE and SMACNA .
- .4 Install breakaway joints in ductwork on sides of fire separation.
- .5 Manufacture duct in lengths and diameter to accommodate installation of acoustic duct lining. Dimensions indicated on drawings are clear inside dimensions after the installation of acoustic insulation.
- .6 Seal all joints.

3.3 HANGERS

- .1 Strap hangers: install in accordance with SMACNA .
- .2 Angle hangers: complete with locking nuts and washers.
- .3 Hanger spacing: in accordance with as follows:

Duct Size	Spacing
(mm)	(mm)
to 1500	3000
1501 and over	2500

3.4 SEALING AND TAPING

- .1 Apply sealant in accordance with to manufacturer's recommendations SMACNA .
- .2 Bed tape in sealant and recoat with minimum of 1 coat of sealant to manufacturers recommendations.

3.5 LEAKAGE TESTS

- .1 In accordance with SMACNA HVAC Duct Leakage Test Manual .
- .2 Do leakage tests in sections.
- .3 Make trial leakage tests as instructed to demonstrate workmanship.
- .4 Do not install additional ductwork until trial test has been passed.

- .5 Test section minimum of 30 m long with not less than three branch takeoffs and two 90 degrees elbows.
- .6 Complete test before performance insulation or concealment Work.

3.6 CLEANING

- .1 Progress Cleaning: clean in accordance with Section 01 74 00- Cleaning .
 - .1 Leave Work area clean at end of each day.
- .2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 74 00- Cleaning .
- .3 Waste Management: separate waste materials for reuse recycling in accordance with Section 01 74 19- Waste Management and Disposal .
 - .1 Remove recycling containers and bins from site and dispose of materials at appropriate facility.

END OF SECTION

Part 1 General

1.1 REFERENCE STANDARDS

- .1 Sheet Metal and Air Conditioning Contractors' National Association (SMACNA)
 - .1 SMACNA - HVAC Duct Construction Standards - Metal and Flexible, 2005.

1.2 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Submit in accordance with Section 01 33 00- Submittal Procedures.
- .2 Product Data:
 - .1 Submit manufacturer's instructions, printed product literature and data sheets for air duct accessories and include product characteristics, performance criteria, physical size, finish and limitations.
 - .2 Indicate:
 - .1 Flexible connections.
 - .2 Duct access doors.
 - .3 Turning vanes.
 - .4 Instrument test ports.

1.3 DELIVERY, STORAGE AND HANDLING

- .1 Deliver, store and handle materials in accordance with Section 01 61 00- Common Product Requirements with manufacturer's written instructions.
- .2 Delivery and Acceptance Requirements: deliver materials to site in original factory packaging, labelled with manufacturer's name and address.
- .3 Storage and Handling Requirements:
 - .1 Store materials indoors off ground in dry location and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.
 - .2 Store and protect air duct accessories from nicks, scratches, and blemishes.
 - .3 Replace defective or damaged materials with new.
- .4 Develop Waste Reduction Workplan Construction Waste Management Plan related to Work of this Section.
- .5 Packaging Waste Management: remove for reuse and return by manufacturer of crates, packaging materials pallets, padding, as specified in Construction Waste Management Plan Waste Reduction Workplan in accordance with Section 01 74 19- Waste Management and Disposal.

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.
.2	Material:
.1	Fire resistant, self-extinguishing, neoprene coated glass fabric, temperature rated at minus 40 degrees C to plus 90 degrees C, density of 1.3 kg/m2.
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 fibre insulation.
.3	Gaskets: foam rubber.
.4	Hardware:
.1	Up to 300 x 300 mm: two sash locks complete with safety chain.
.2	301 to 450 mm: four sash locks complete with safety chain.
.3	451 to 1000 mm: piano hinge and minimum two sash locks.
2.4	TURNING VANES
.1	Factory or shop fabricated double thickness with trailing edge , to recommendations of SMACNA and as indicated.
2.5	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	Neoprene mounting gasket.
2.6	SPIN-IN COLLARS
.1	Conical galvanized sheet metal spin-in collars with lockable butterfly damper.
.2	Sheet metal thickness to co-responding round duct standards.

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 air duct accessories installation in accordance with manufacturer's written instructions.
 - .1 Visually inspect substrate in presence of Departmental Representative .
 - .2 Inform Departmental Representative of unacceptable conditions immediately upon discovery.
 - .3 Proceed with installation only after unacceptable conditions have been remedied and after receipt of written approval to proceed from Departmental Representative.

3.2 INSTALLATION

- .1 Flexible Connections:
 - .1 Install in following locations:
 - .1 Inlets and outlets to supply air units and fans.
 - .2 Inlets and outlets of exhaust and return air fans.
 - .3 As indicated.
 - .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 sides of flexible connection to be in alignment.
 - .2 Ensure slack material in flexible connection.
 - .6 Locations and Size:

.1 Fire and smoke dampers	300x300mm
.2 Control dampers	200x200mm
.3 Devices requiring maintenance	450x450mm
.4 Reheat coils.	300x300mm
.5 Air monitoring station	450x450mm
- .2 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 required.
 - .4 Locations:

-
- .1 For traverse readings:
 - .1 Main and sub-main ducts.
 - .3 Turning Vanes:
 - .1 Install in accordance with recommendations of SMACNA and as indicated.

3.3 CLEANING

- .1 Progress Cleaning: clean in accordance with Section 01 74 00- Cleaning .
 - .1 Leave Work area clean at end of each day.
- .2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 74 00- Cleaning .
- .3 Waste Management: separate waste materials for reuse recycling in accordance with Section 01 74 19- Waste Management and Disposal .
 - .1 Remove recycling containers and bins from site and dispose of materials at appropriate facility.

END OF SECTION

Part 1 General

1.1 REFERENCE STANDARDS

- .1 Sheet Metal and Air Conditioning National Association (SMACNA)
 - .1 SMACNA HVAC Duct Construction Standards, Metal and Flexible-2013 .

1.2 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Submit in accordance with Section 01 33 00- Submittal Procedures .
- .2 Product Data:
 - .1 Submit manufacturer's instructions, printed product literature and data sheets for dampers and include product characteristics, performance criteria, physical size, finish and limitations.

1.3 CLOSEOUT SUBMITTALS

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

1.4 DELIVERY, STORAGE AND HANDLING

- .1 Deliver, store and handle materials in accordance with Section 01 61 00- Common Product Requirements with manufacturer's written instructions .
- .2 Delivery and Acceptance Requirements: deliver materials to site in original factory packaging, labelled with manufacturer's name and address.
- .3 Storage and Handling Requirements:
 - .1 Store materials indoors in dry location off ground and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.
 - .2 Store and protect dampers from nicks, scratches, and blemishes .
 - .3 Replace defective or damaged materials with new.
- .4 Develop Construction Waste Management Plan Waste Reduction Workplan related to Work of this Section .
- .5 Packaging Waste Management: remove for reuse by manufacturer and return of crates, pallets, padding, packaging materials as specified in Construction Waste Management Plan Waste Reduction Workplan in accordance with Section 01 74 19- Waste Management and Disposal .

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.
- .3 Locking quadrant with shaft extension to accommodate insulation thickness .
- .4 Inside and outside nylon end bearings.
- .5 Channel frame of same material as adjacent duct, complete with angle stop.

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 damper installation in accordance with manufacturer's written instructions.
 - .1 Visually inspect substrate in presence of Departmental Representative .
 - .2 Inform Departmental Representative of unacceptable conditions immediately upon discovery.
 - .3 Proceed with installation only after unacceptable conditions have been remedied and after receipt of written approval to proceed from Departmental Representative.

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 Runouts to registers and diffusers: install single blade damper located as close as possible to main ducts.
 - .5 Dampers: vibration free.
 - .6 Ensure damper operators are observable and accessible.
 - .7 Corrections and adjustments conducted by Departmental Representative .

3.3 CLEANING

- .1 Progress Cleaning: clean in accordance with Section 01 74 00- Cleaning .
 - .1 Leave Work area clean at end of each day.
- .2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 74 00- Cleaning .
- .3 Waste Management: separate waste materials for reuse recycling in accordance with Section 01 74 19- Waste Management and Disposal .
 - .1 Remove recycling containers and bins from site and dispose of materials at appropriate facility.

END OF SECTION

Part 1 General

1.1 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Submit in accordance with Section 01 33 00- Submittal Procedures.
- .2 Product Data:
 - .1 Submit manufacturer's instructions, printed product literature and data sheets for air terminal units and include product characteristics, performance criteria, physical size, finish and limitations.
- .3 Shop Drawings:
 - .1 Indicate the following:
 - .1 Air Volume Capacity.
 - .2 Air and Fluid Pressure drop at maximum air volume.
 - .3 Noise rating.
 - .4 Heating coil capacity

1.2 CLOSEOUT SUBMITTALS

- .1 Submit in accordance with Section 01 78 00- Closeout Submittals.
- .2 Operation and Maintenance Data: submit operation and maintenance data for air terminal units for incorporation into manual.

1.3 DELIVERY, STORAGE AND HANDLING

- .1 Deliver, store and handle materials in accordance with Section with manufacturer's written instructions 01 61 00- Common Product Requirements.
- .2 Delivery and Acceptance Requirements: deliver materials to site in original factory packaging, labelled with manufacturer's name and address.
- .3 Storage and Handling Requirements:
 - .1 Store materials indoors in dry location off ground and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.
 - .2 Store and protect air terminal units from nicks, scratches, and blemishes.
 - .3 Replace defective or damaged materials with new.
- .4 Develop Construction Waste Management Plan Waste Reduction Workplan related to Work of this Section.
- .5 Packaging Waste Management: remove for reuse and return by manufacturer of crates, pallets, padding, packaging materials as specified in Waste Reduction Workplan Construction Waste Management Plan in accordance with Section 01 74 19- Waste Management and Disposal.

Part 2 Products

2.1 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 certified ADC (Air Diffusion Council) testing agency signifying adherence to codes and standards.

2.2 MANUFACTURED UNITS

- .1 Terminal units of the same type to be product of one manufacturer.

2.3 ELECTRONIC VARIABLE AIR VOLUME BOXES

- .1 Pressure independent, reset to air flow between zero and maximum air volume.
- .2 At inlet velocity of 10 m/s, differential static pressure for unit with 1500mm attenuator section not to exceed 25 Pa.
- .3 Sound ratings of assembly not to exceed 35dba
- .4 Air velocity sensor pitot rack .
- .5 Signals between temperature sensing device, velocity controller, velocity sensor and damper actuator analogue. Shielded or twisted wire requirements is not acceptable.
- .6 Electronic control package factory calibrated and set at factory. Features to accommodate field calibration and readjustment of air volume settings to include:
 - .1 Metre taps for balancing with digital DC voltmeter.
 - .2 Adjustable flow settings at thermostat.
- .7 Factory installed 20 VA transformer, 115 V to 24 V. Power consumption of terminal not to exceed 15 VA.
- .8 Terminal unit to be CSA certified.
- .9 Casing. 25 kg density fibrous glass, to . Mount control components inside protective metal shroud. UL 181
- .10 Sizes and capacity: as indicated.

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 air terminal units installation in accordance with manufacturer's written instructions.
 - .1 Visually inspect substrate in presence of Departmental Representative.

- .2 Inform Departmental Representative of unacceptable conditions immediately upon discovery.
- .3 Proceed with installation only after unacceptable conditions have been remedied and after receipt of written approval to proceed from Departmental Representative.

3.2 INSTALLATION

- .1 Install in accordance with manufacturers recommendations.
- .2 Support independently of ductwork.
- .3 Install with at least 1000 mm of flexible inlet ducting and minimum of four duct diameters of straight inlet duct, same size as inlet.
- .4 Locate controls, dampers and access panels for easy access.

3.3 CLEANING

- .1 Progress Cleaning: clean in accordance with Section 01 74 00- Cleaning.
 - .1 Leave Work area clean at end of each day.
- .2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 74 00- Cleaning.
- .3 Waste Management: separate waste materials for reuse recycling in accordance with Section 01 74 19- Waste Management and Disposal.
 - .1 Remove recycling containers and bins from site and dispose of materials at appropriate facility.

END OF SECTION

Part 1 General

1.1 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Submit in accordance with Section 01 33 00- Submittal Procedures .
- .2 Product Data:
 - .1 Submit manufacturer's instructions, printed product literature and data sheets for diffusers, registers and grilles and include product characteristics, performance criteria, physical size, finish and limitations.
 - .2 Indicate following:
 - .1 Capacity.
 - .2 Throw and terminal velocity.
 - .3 Noise criteria.
 - .4 Pressure drop.
 - .5 Neck velocity.

1.2 MAINTENANCE MATERIAL SUBMITTALS

- .1 Extra Materials:
 - .1 Provide maintenance materials in accordance with Section 01 78 00- Closeout Submittals .
 - .2 Include:
 - .1 Keys for volume control adjustment.
 - .2 Keys for air flow pattern adjustment.

1.3 DELIVERY, STORAGE AND HANDLING

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

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

Part 2 Products

2.1 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.

2.2 GENERAL

- .1 To meet capacity, pressure drop, terminal velocity, throw, noise level, neck velocity as indicated .
- .2 Frames:
 - .1 Full perimeter gaskets.
 - .2 Plaster frames where set into plaster or gypsum board and as specified .
 - .3 Concealed fasteners.
- .3 Colour: as directed by Departmental Representative.

2.3 MANUFACTURED UNITS

- .1 Grilles, registers and diffusers of same generic type, products of one manufacturer.

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 diffuser, register and grille installation in accordance with manufacturer's written instructions.
 - .1 Visually inspect substrate in presence of Consultant Departmental Representative .
 - .2 Inform Consultant Departmental Representative of unacceptable conditions immediately upon discovery.
 - .3 Proceed with installation only after unacceptable conditions have been remedied and after receipt of written approval to proceed from Departmental Representative .

3.2 INSTALLATION

- .1 Install in accordance with manufacturers instructions.
- .2 Install with stainless steel oval head flat head cadmium plated screws in countersunk holes where fastenings are visible.
- .3 Bolt grilles, registers and diffusers, in place, in gymnasium and similar game rooms.
- .4 Provide concealed safety chain on each grille, register and diffuser in gymnasium and similar game rooms and elsewhere as indicated .

3.3 CLEANING

- .1 Progress Cleaning: clean in accordance with Section 01 74 00- Cleaning .
 - .1 Leave Work area clean at end of each day.
- .2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 74 00- Cleaning .
- .3 Waste Management: separate waste materials for reuse recycling in accordance with Section 01 74 19- Waste Management and Disposal .
 - .1 Remove recycling containers and bins from site and dispose of materials at appropriate facility.

END OF SECTION

Section Number	Section Title	No. of Pages
DIVISION 26 - ELECTRICAL		
260010	Basic Electrical Material and Methods	8
260520	Wire and Box Connectors 0-1000V	2
260521	Wire and Cables	3
260525	Grounding	2
260529	Fastening & Supports	2
260532	Outlet Boxes, Conduit Boxes and Fittings	1
260534	Conduit, Conduit Fastenings and Conduit Fittings	3
262416	Panelboards	3
262726	Wiring Devices	4
265000	Lighting	3
DIVISION 28 – FIRE ALARM		
280000	Fire Alarm System	3

END OF SECTION

Part 1 General

1.1 RELATED WORK

- .1 Division 0 – Bidding & Contract Requirements
- .2 General Requirements
- .3 All Electrical Drawings and Division 26, 27 and 28 Series Specification Sections.

1.2 QUALITY ASSURANCE

- .1 The electrical systems will be design and installed to comply with the latest editions of the following codes as applicable:
- .2 Manitoba Building Code
- .3 Canadian Electrical Code C22.1-12 2015
- .4 CAN/ULC S-524-06 Installation of Fire Alarm Systems
- .5 CAN/ULC S-537 Verification of Fire Alarm systems
- .6 Applicable STANDATA
- .7 Do complete installations in accordance with CSA C22.1-2006.
- .8 While not identified and specified by number in this Division, comply with CSA Electrical Bulletins in force at time of tender submission. Comply with the requirements of all Provincial and local laws, rules, ordinances and codes.
- .9 Electrical installation shall be in accordance with the current edition of the Canadian Electrical Code, Provincial and other codes, rules and regulations. Supply material and labour required to meet the requirements of these codes, rules and regulations even though the work is not shown on the drawings or mentioned in the specifications. Where the electrical installation calls for better quality materials or construction than the minimum requirements of these codes, rules and regulations, the electrical installation shall be as shown on the drawings and as specified.
- .10 Electrical installation shall be in accordance with the requirements of the electrical supply authority and local inspection authority.

1.3 PERMITS, FEES

- .1 Submit to Electrical Inspection Department and Supply Authority necessary number of drawings and specifications for examination and approval prior to commencement of work.
- .2 Obtain all necessary permits required for the electrical installation.
- .3 Pay all fees for permits and inspections as required for the electrical installation.

1.4 MATERIALS AND EQUIPMENT

- .1 Provide labour, materials, transportation, equipment and facilities, etc., required for the complete electrical installation as indicated or implied on the drawings and specifications.
- .2 Electrical equipment shall be new and of type and quality specified.
- .3 Equipment and material shall be CSA certified, and manufactured to standards described. Where there is no alternative to supplying equipment which is not CSA certified, obtain special approval from the appropriate Inspection Departments.

1.5 SUBMITTALS

- .1 Submit shop drawings and product data for review by the Consultant. All drawings shall be in English and Imperial dimensions or in metric where indicated. Manufacture of equipment shall not commence until shop drawings have been reviewed. Shop drawings may be submitted electronically or 10 hard copies. The MCW/AGE shop drawing email address for electrical submission is wpg.shopdrawings@mcw.com. Shop drawings shall be reviewed prior to submittal to Consultant, confirming that they meet all the design requirements. Mark up and sign Contractor approval on the drawings.
- .2 Indicate details of construction, dimensions, capacities, weights and electrical performance characteristics of equipment or material.
- .3 Where applicable, include wiring, single line and schematic diagrams.
- .4 Include wiring drawings or diagrams showing inter-connection with work of other sections.
- .5 Submit samples in accordance with General Conditions. Samples shall be forwarded to the Consultant's office and return. Approved samples will be retained until after tender closing, then all samples will be returned except for the sample submitted by the Manufacturer who has been listed by the successful Contractor in the tender documents. This sample will be used for comparison with the actual production run of successful manufacturer.
- .6 Submit shop drawings of service entrance equipment to utilities.
- .7 Material submitted for Consultant's review shall bear Contractor's, and where applicable, Utility reviewed stamp.

1.6 OPERATIONS AND MAINTENANCE DATA

- .1 Provide operation and maintenance data for incorporation into Maintenance Manuals.

-
- .2 Include details of design elements, construction features, component function and maintenance requirements, to permit effective start-up, operation, maintenance, repair, modification, extension and expansion of any portion or feature of installation.
 - .3 Include technical data, product data, supplemented by bulletins, component illustrations, exploded views, technical descriptions of items, and parts lists. Advertising or sales literature not acceptable.
 - .4 Include wiring and schematic diagrams and performance curves.
 - .5 Include names and addresses of local suppliers for items included in Maintenance Manuals.
 - .6 Submit Maintenance Manuals to the Consultant for review. Manuals that are incomplete shall be returned to the Electrical Sub-Contractor for completion. Completed manuals shall be submitted, to the satisfaction of the Consultant, before final payment may be considered to be due.

1.7 MAINTENANCE MANUALS

- .1 Provide maintenance materials as specified.
- .2 Turn materials over to Owner in an orderly fashion upon completion of installation.

1.8 VOLTAGE RATINGS

- .1 Operating voltages: to CAN3-C235-83.
- .2 Motors, electrical heating, control and distribution devices and equipment to operate satisfactorily at 60 Hz within normal operating limits established by above standard. Equipment shall operate in extreme operating conditions established in above standard without damage to equipment.

1.9 INSPECTION

- .1 Furnish a Certificate of Acceptance from the Inspection Authorities on completion of work. Copies of certificate shall be included in Maintenance Manuals.
- .2 Certificate of Inspection of Approval shall be submitted before final payment may be considered to be due.
- .3 During the course of the project construction, the Consultant will carry out periodic site reviews and prepare a deficiency list for remedial action by the Electrical Subcontractor. When requested, the Electrical Contractor shall respond in writing to the Consultant, stating corrective action and completion date for each item listed as deficient. This response shall be in the hands of the Consultant within three working days of receipt of the Inspection Report.

1.10 CARE, OPERATION AND START-UP

- .1 Instruct the Owner's operating personnel in the operation, care and maintenance of equipment. Arrangement of such instructional sessions shall be done at a time convenient to the Owner.
- .2 Arrange and pay for services of Manufacturer's factory service engineer to supervise start-up of installation, check, adjust, balance and calibrate components.
- .3 Provide these services for such a period, and for as many visits as necessary to put equipment into operation, and ensure that operating personnel are conversant with all aspects of its care and operation.

1.11 FINISHES

- .1 Finish outdoor electrical equipment such as parking lot panels, to match light standards.
- .2 Clean and touch up surfaces of shop-painted equipment, scratched or marred during shipment or installation, to match original paint.
- .3 Clean, prime and paint exposed hangers, racks, fastenings to prevent rusting.

1.12 EQUIPMENT IDENTIFICATION

- .1 Identify electrical equipment with lamacoid nameplates.
- .2 Provide lamacoid nameplates, 1/8" (3mm) thick plastic engraving sheet, black or red face, white core, mechanically attached (screwed or riveted) unless specified otherwise.
Sizes as follows:

Size 0	3.8" x 1 1/2" (10 x 38 mm)	1 line	1/8"	(3mm) high letters
Size 1	3/8" x 4" (10 x 100mm)	1 line	1/8"	(3 mm) high letters
Size 2	1/2" x 3" (13 x 75mm)	1 line	3/16"	(5 mm) high letters
Size 3	1/2" x 3" (13 x 75mm)	2 lines	1/8"	(3 mm) high letters
Size 4	3/4" x 3" (19 x 75mm)	1 line	3/8"	(10mm)high letters
Size 5	3/4" x 4" (19 x 100mm)	2 lines	3/16"	(5 mm) high letters
Size 6	1" x 4" (25 x 100mm)	1 line	1/2"	(13mm)high letters
Size 7	1" x 4" (25 x 100mm)	2 lines	1/4"	(6 mm) high letters
- .3 Wording on nameplates shall be approved prior to manufacture. Submit schedule of nameplates and wording.
- .4 Allow for average of twenty-five (25) letters per nameplate.
- .5 Identification shall be English.
- .6 Nameplates for terminal cabinets and junction boxes shall indicate system and/or voltage characteristics.
- .7 Use black nameplates with white lettering for normal power and communications equipment. Use red nameplates with white lettering for emergency power and fire alarm equipment.

1.13 PROJECT RECORD DOCUMENTS

- .1 Project record documents shall be transferred to electronic disc AutoCAD file and labelled "Record Drawings". The Electrical Sub-Contractor shall be responsible for the production of electrical as-constructed drawings which shall provide a complete and accurate record of the actual electrical installation. The Electrical Contractor shall affix his company name and the words "Record Drawings" on the drawings, and sign and date them. Submit disc and hard copy for final review and submission to the owners upon completion. Record documents that are incomplete shall be returned to the Electrical Sub-Contractor for remedial measures. The Consultants shall recommend a suitable deficiency holdback until such time as "record drawings" are submitted in the acceptable form.
- .2 Indicate on record drawings, location of all buried services. This information is to be certified correct by Consultant before backfilling commences.
- .3 Contractor to take all schedules/details from specification and put onto additional drawing sheets for Record Drawings.

1.14 DEFINITIONS

- .1 The following are definitions of terms and expressions used in the specification:
 - .1 CONSULTANT means Electrical Engineering Consultant:
 - .2 MCW/AGE Consulting Professional Engineers
 - .3 INSPECTION AUTHORITY means agent of any authority having jurisdiction over construction standards associated with any part of electrical work on site.
 - .4 SUPPLY AUTHORITY means electrical power utility company responsible for delivery of electrical power to project.
 - .5 ELECTRICAL CODE means as shown on contract drawings or noted in Contract Documents.
 - .6 TYPE TESTED means that each piece of equipment produced by Manufacturer is not fully tested. An original piece with similar arrangement has been fully tested and results of that test are available.
 - .7 PROVIDE means to supply, install and leave in working order all materials and necessary wiring, supports, access panels, etc., as necessary for equipment indicated.

1.15 LABELS AND WARNING SIGNS

- .1 Manufacturer's nameplates and CSA labels shall be visible and legible after equipment is installed.
- .2 Provide warning signs on equipment, as required, to meet the requirements of the Inspection Authorities, including indication of multiple power sources.

1.16 LOCATION OF OUTLETS

- .1 Locate outlets as indicated

- .2 Do not install outlets back-to-back in wall; allow minimum 16" (400 mm) horizontal clearance between boxes.
- .3 Drawings are schematic only and do not indicate all architectural or structural elements.
- .4 Change location of outlets at no extra cost or credit, providing distance does not exceed 10'-0" (3 m) and information is provided before installation.
- .5 Locate light switches on latch side of doors.
- .6 Vertically align outlets of different systems when shown in close proximity to each other and occurring at different mounting heights.
- .7 Coordinate mounting heights and location of all equipment with Architectural, Mechanical and Structural Drawings prior to installation of rough-in boxes.

1.17 MOUNTING

- .1 Mounting height of equipment is from finished floor to centreline of equipment unless specified or indicate otherwise.
- .2 Mounting height of equipment shall be as per Architectural clarifications. Where elevations are not indicated, the following shall apply:
 - .1 Outlets above counters: 6" (150mm); splashbacks: 100mm.
 - .2 General receptacles, communication and television outlets: 500mm.
 - .3 Receptacles in mechanical and shop areas: 1025mm.
 - .4 Switches, dimmers, push buttons: 1150mm.
 - .5 Fire alarm pullstations: 1150mm.
 - .6 End of line resistors: 1625mm.
 - .7 Fire alarm visual, audible, and combination devices:
 - .1 2350mm or,
 - .2 150mm below ceiling measured from top edge of device where mounting height will be lower than 2350mm.
 - .8 Intercom stations, keypads: 1150mm (LCD/Video display T.B.C.).
 - .9 Thermostats: 1150mm.
 - .10 Card readers, panic switches: 1150mm.
 - .11 Branch circuit panels, control panels, annunciators, etc.: 72" (1825mm).
To top of panel.
 - .12 Exit signage: 2350mm.
 - .13 Occupancy sensor as per Manufacturer's instruction.
- .4 Refer to accessibility design standards.

1.18 PROTECTION

- .1 Protect exposed live equipment during construction for personnel safety.

- .2 Shield and mark live parts "LIVE () VOLTS", with appropriate voltage in English.
- .3 Arrange for installation of temporary doors for rooms containing electrical distribution equipment. Keep these doors locked except when under direct supervision.
- .4 Provide wire guards for all electrical equipment in Gymnasium or areas subject to damage.

1.19 LOAD BALANCE

- .1 Measure phase current to panelboards with normal loads operating at time of measurement. Adjust branch circuit connections as required to obtain best balance of current between phases and record changes.
- .2 Measure phase voltages at loads and adjust transformer taps to within 2% of rated voltage of equipment.
- .3 Submit, at completion of work, a report listing phase and neutral currents on panelboards, transformers and motor control centres, operating under normal load. State hour and date on which each load was measured, and voltage at time of test.
- .4 Include load balance and voltage test results as per Form 26 00 10.2.1.5.

1.20 CONDUIT SLEEVES AND HOLES

- .1 Install conduit, and sleeves, prior to pouring of concrete. Sleeves through concrete shall be sized for free passage of conduit.
- .2 Holes through exterior walls and roof shall be flashed and made weatherproof.
- .3 Make necessary arrangements for cutting of chases, drilling of holes and other structural work required to install electrical conduits, cables, pullboxes and outlet boxes.
- .4 Install cables, conduits, and fittings to be embedded or plastered over, neatly and close to building structure so furring can be kept to minimum.

1.21 TESTS

- .1 Conduct and pay for tests including, but not limited to, the following systems:
 - .1 Circuits originating from branch distribution panels.
 - .2 Lighting and its control.
 - .3 Motors, heaters and associated control equipment including sequenced operation of systems where applicable.
 - .4 Systems: Fire alarm, voice communication, etc. as applicable.
 - .5 Grounding systems.
 - .6 Local area network systems.
 - .7 Heat trace and heating mats.

-
- .2 Furnish Manufacturer's Certificate or letter confirming that entire installation, as it pertains to each system, has been installed to Manufacturer's instructions. Submit letter in accordance with Section 26 00 10.2.1.7.
 - .3 Carry out tests in presence of Consultant where directed.
 - .4 Provide instruments, meters, equipment and personnel required to conduct tests during and at conclusion of project.
 - .5 Submit test results in Maintenance Manuals.

1.22 INSULATION RESISTANCE TESTING

- .1 Megger circuits, feeders and equipment up to 350V with a 500V instrument.
- .2 Megger 350-600V circuits, feeders and equipment with a 1000V instrument.
- .3 Check resistance to ground before energizing.

1.23 COORDINATION/SHORT CIRCUIT STUDY OF PROTECTIVE DEVICES

- .1 Provide under professional Engineer seal, registered in applicable jurisdiction a Coordination/Short Circuit/Arc Flash Study for service entrance equipment, main distribution switchboard breakers and first level of sub-distribution (including 120/208V transformers) to ensure proper short circuit capacity and proper selective coordination. Submit a copy of the Coordination/Short Circuit Study to the Consultant with distribution shop drawings and include one copy in each Maintenance Manual.
- .2 Ensure circuit protective devices such as overcurrent trips, relays, fuses, are installed to values and settings as recommended in Study.

1.24 CLEANING

- .1 At time of final cleaning, clean lighting reflectors, lenses, and other lighting surfaces that have been exposed to construction dust and dirt.

1.25 DELIVERY STORAGE AND HANDLING

- .1 Deliver all materials to site in an orderly fashion.
- .2 Store all materials in a clean and dry place, secure from vandalism or theft. All materials shall be left in shipping containers until required for use.
- .3 Provide additional protection such as tarps, padding, wood skids, etc., where such is required to ensure protection of equipment and as directed by the Architect.

1.26 COORDINATION WITH OTHER TRADES

- .1 Refer to Mechanical, Structural, Architectural and Interior Design drawings and specifications for additional electrical work in connection with other Divisions. Where such work is included in other sections of the specifications, provide equipment, conduit, wiring, etc. (in accordance with the Manufacturer's approved shop drawings), as required, for operation of the specified equipment.
- .2 Schedule execution of electrical work with associated work specified in other Divisions.
- .3 Coordinate electrical work with work of other trades to avoid conflicts with pipes, air ducts or other equipment. Provide additional supports, wiring, etc. to relocate electrical equipment, as required, where structural members, air ducts, piping or other equipment interferes with the electrical installation.

1.27 EXAMINATION OF SITE AND CONSTRUCTION DOCUMENTS

- .1 Prior to submitting a tender, examine the site and local conditions which will affect the work. Refer to the Architectural, Mechanical and Structural drawings, schedules and specifications for construction details to be certain that the electrical work can be satisfactorily carried out as specified. Claims for extra payments, resulting from conditions, which could reasonably be foreseen during an examination of the documents and/or site, will not be recognized.
- .2 Ensure that all equipment designated as "Existing to Remain" or "Existing to be Relocated" is suitable for its intended re-use, including panelboards and circuits. Report any discrepancies to the Consultant BEFORE close.
- .3 Refer to General Conditions for instructions regarding a pre-arranged site visit during the tender period.

1.28 EXCAVATION AND BACKFILLING

- .1 Excavate and backfill as required for underground electrical services as indicated. Provide protective materials around and over services and be present at all times during excavation and backfilling to supervise work. Backfilling shall restore the excavated area to the original condition and shall include sodding where required.
- .2 Work shall be in accordance with the current CSA Bulletin.
- .3 Include all costs for excavation and backfilling, for any underground electrical installation, unless otherwise indicated.

1.29 CUTTING AND PATCHING

- .1 Pay the costs of all cutting and patching required for the installation of electrical work. Payment for cutting and patching shall be made through the General Contractor.
- .2 Cutting and patching required for the installation of electrical work shall be done by the particular trade whose work is involved. No cutting or patching shall be carried out by the tradesman employed on the electrical work.

- .3 Obtain the approval of the Architect and/or Owner before arranging for any cutting. Patching shall restore the affected area to the original condition; materials and methods used for patching shall be in accordance with the requirements of the corresponding Divisions of the specification.

1.30 WORKMANSHIP

- .1 Install equipment, conduit and cables in a workmanlike manner to present a neat appearance to the satisfaction of the Consultant. Install conduit and cable runs parallel and perpendicular to building lines in chases, behind furring or above ceilings, where such concealment is possible. In areas where systems are shall be exposed, install neatly and group in a tidy appearance.
- .2 Install equipment and apparatus requiring maintenance, adjustment or eventual replacement, with adequate clearances and accessibility for same.
- .3 Include, in the work, all requirements shown on the shop drawings or Manufacturer's installation instructions.
- .4 Replace work unsatisfactory to the Consultant without extra cost.

1.31 ACCESS DOORS

- .1 Access doors shall be a minimum #12 gauge prime coat painted bonderized steel. Each shall be complete with a heavy flush frame and anchor, concealed hinges, positive locking screwdriver lock, and mounting and finishing provisions to suit the finish material for which they are supplied. Access doors in fire rated ceilings, walls, partitions, structures, etc. shall be U.L.C. listed and labelled and of a rating to maintain the fire separation integrity.
- .2 Where access doors are located in surfaces where special finishes are required, they shall be of a recessed door type capable of accepting the finish in which they are to be installed so as to maintain the fire separation integrity.
- .3 Supply access doors in inaccessible construction shall give access to all concealed junction boxes, pullboxes, conductor joints and other similar electrical work which may need maintenance or repair.
- .4 Before commencing installation of electrical work submit, to the Architect for approval, a list of required access doors showing the exact sizes and locations of such access doors. Locate access doors in walls and partitions to the Architect's approval, and arrange electrical work to suit. Access doors shall be, wherever possible, of a standard size for all application. Confirm exact dimensions with the Architect, prior to ordering.
- .5 Access doors shall be installed by the Division responsible for the particular type of construction in which access doors are required. Supply the access doors to the Division installing same at the proper time to avoid construction delays.

1.32 SPARE PARTS

-
- .1 Assemble spare parts as specified:
 - .2 Include the following:
 - .1 Part number.
 - .2 Identification of equipment or system for which parts applicable.
 - .3 Installation instructions as applicable.
 - .3 Provide a written list complete with Owner's signature assuring that spare parts have been received by the Owner.

1.33 CASH ALLOWANCES

- .1 Refer to General Conditions for any further requirements under this heading.

Part 2 Products

2.1 NOT USED

- .1 Not Used

Part 3 Execution

3.1 Not Used

- .1 Not Used

END OF SECTION

Part 1 General

1.1 REFERENCES

- .1 CSA International
 - .1 CAN/CSA-C22.2 No.18-98(R2003), Outlet Boxes, Conduit Boxes and Fittings.
 - .2 CAN/CSA-C22.2 No.65-03(R2008), Wire Connectors (Tri-National Standard with UL 486A-486B and NMX-J-543-ANCE-03).
- .2 Electrical and Electronic Manufacturers' Association of Canada (EEMAC)
 - .1 EEMAC 1Y-2-1961, Bushing Stud Connectors and Aluminum Adapters (1200 Ampere Maximum Rating).
- .3 National Electrical Manufacturers Association (NEMA)

1.2 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Submit in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Product Data:
 - .1 Submit manufacturer's instructions, printed product literature and data sheets for wire and box connectors and include product characteristics, performance criteria, physical size, finish and limitations.

1.3 CLOSEOUT SUBMITTALS

- .1 Submit in accordance with Section 01 78 00 - Closeout Submittals.
- .2 Operation and Maintenance Data: submit operation and maintenance data for wire and box connectors for incorporation into manual.

1.4 DELIVERY, STORAGE AND HANDLING

- .1 Deliver, store and handle materials in accordance with Section 01 61 00 - Common Product Requirements.
- .2 Delivery and Acceptance Requirements: deliver materials to site in original factory packaging, labelled with manufacturer's name and address.
- .3 Storage and Handling Requirements:
 - .1 Store materials off ground and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.
 - .2 Replace defective or damaged materials with new.

Part 2 Products

2.1 MATERIALS

- .1 Pressure type wire connectors to: CAN/CSA-C22.2 No.65, with current carrying parts of sized to fit copper conductors as required.
- .2 Fixture type splicing connectors to: CAN/CSA-C22.2 No.65, with current carrying parts of copper sized to fit copper conductors 10 AWG or less.

- .3 Bushing stud connectors: to EEMAC 1Y-2 NEMA to consist of:
 - .1 Connector body and stud clamp for stranded copper conductors.
 - .2 Clamp for stranded round copper conductors bar.
 - .3 Clamp for stranded aluminum conductors .
 - .4 Bolts for copper conductors.
- .4 Clamps or connectors for armoured cable, TECK cable flexible conduit, non-metallic sheathed cable as required to: CAN/CSA-C22.2 No.18.

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 wire and box connectors installation in accordance with manufacturer's written instructions.
 - .1 Visually inspect substrate in presence of Departmental Representative.
 - .2 Inform Departmental Representative of unacceptable conditions immediately upon discovery.
 - .3 Proceed with installation only after unacceptable conditions have been remedied and after receipt of written approval to proceed from Departmental Representative.

3.2 INSTALLATION

- .1 Remove insulation carefully from ends of conductors and:
 - .1 Apply coat of zinc joint compound on aluminum conductors prior to installation of connectors.
 - .2 Install mechanical pressure type connectors and tighten screws with appropriate compression tool recommended by manufacturer. Installation shall meet secureness tests in accordance with CAN/CSA-C22.2 No.65.
 - .3 Install fixture type connectors and tighten to CAN/CSA-C22.2 No.65. Replace insulating cap.
 - .4 Install bushing stud connectors in accordance with EEMAC 1Y-2 NEMA.

3.3 CLEANING

- .1 Leave Work area clean at end of each day.

END OF SECTION

Part 1 General

1.1 RELATED WORK

- .1 Section 26 00 10 – Basic Electrical and Methods
- .2 Section 26 05 32 – Outlet Boxes, Conduit Boxes and Fittings
- .3 Section 26 05 34 – Conduits, Conduit Fastenings and Conduit Fittings
- .4 Section 27 05 30 - Communication Raceways

Part 2 Products

2.1 MATERIALS

- .1 Conductors in Conduit (R-90):
 - Type: RW-90
 - Conductors: Solid copper #10 AWG and smaller.
 Stranded copper #8 AWG and larger.
 Sized as indicated (minimum #12 AWG)
 - Insulation: Cross link polyethylene (XLPE), 90°C. (194°F)
 - Configuration: Single conductor
 - Voltage Rating: 1000V
 - Certification: CSA C22.22 No.38 or latest revision
 - Certification : CSA C22.22 No. 123 or latest revision.
 - Ground: Provide bare ground sized to Table 17 C.E.C.
- .2 Fire Alarm
 - Conductor: Solid copper #18 AWG.
 - Insulation: 105°C (221°F) flame retardant PVC.
 - Configuration Multi-conductor (minimum 4 conductors per cable).
 - Voltage Rating: 300V
 - Conductor Color coded.
 - Identification:
 - Shielding: Aluminium mylar foil.
 - Outer Jacket: 105°C (221°F) red PVC jacket.
 - Certification: CSA Class #5851-01 File #LR41741.
 UL subject 1424 File #E-83163.

Part 3 Execution

3.1 INSTALLATION IN RACEWAYS

- .1 Install wiring as follows:
 - 1. In conduit systems in accordance with Section 26 05 34.

2. Ensure conduits are dry and free of debris before pulling cables.
3. Color coding and identification as per this Section.
4. Wires in outlet, junction and switch boxes, not having a connection within the box shall not be spliced, but shall continue unbroken through the box.

3.2 INSTALLATION OF FLEXIBLE ARMoured CABLE

- .1 Type AC-90 armoured cable (BX) shall be used for connections from conduit systems to recessed luminaires in accessible ceilings. Cable shall be of sufficient length to allow the lighting fixture to be relocated to any location within a 6' (1.83 m) radius. Cable shall be clamped before entering the lighting fixture and shall be clipped before entering the conduit system junction box. (Minimum requirements)
- .2 Type AC-90 armoured cable may be used for connections from conduit systems to wiring devices in steel stud partitions and for interconnection of wiring devices within steel stud partitions, cable shall be clipped before entering junction or outlet boxes.

3.3 TERMINATIONS

- .1 Terminate wires and cables with appropriate connectors in an approved manner.

3.4 MOTOR CONNECTIONS

- .1 Flexible connections to motors shall not exceed 78" (2 m) unless authorized in writing by Consultant. Utilize liquid-tight flexible metal conduit or Teck cable with approved Teck connectors.

3.5 IDENTIFICATION

- .1 Wire in conduit #2 AWG and smaller shall have solid coloured insulation, color coded as listed below.
- .2 Wire in conduit #1 AWG and larger and single conductor cables for normal power feeders shall be identified at each outlet box and termination with a 6" (150 mm) band of coloured vinyl tape of the appropriate color. Emergency power feeders shall be provided with an additional 3" (75 mm) band of red vinyl tape installed adjacent to the 6" (150 mm) band of the coloured phase identification tape, as listed below. Neutral and ground conductors shall be identified. Paint or other means of coloring the insulation shall not be used.
- .3 Color code wire in conduit and single conductor cables as follows:

Phase A	red		Unless shown otherwise on the drawings.
Phase B	black		
Phase C	blue	.4	Maintain phase sequence and color coding throughout project.
Neutral	white		
Ground	green	.5	Use color coded wires in communication cables, matched throughout system.
- .6 Identify control conductors in motor equipment, contactors, fire alarm panels, etc. with Mylar / cloth wire markers.

END OF SECTION

Part 1 General

1.1 RELATED WORK

- .1 Section 26 05 21 - Wire and Cable

1.2 REFERENCES

- .1 Ground equipment to: CSA C22.2 No. 41.
- .2 Copper grounding conductors to: CSA G7.1

Part 2 Products

2.1 EQUIPMENT

- .1 Grounding conductors system, circuit and equipment, grounding to be bare stranded copper, sized in accordance with the Canadian Electrical Code.
- .2 Non-corroding accessories necessary for grounding system, type, size, material as indicated, including but not necessarily limited to:
 - .1 Grounding and bonding bushings
 - .2 Protective type clamps
 - .3 Bolted type conductor connectors
 - .4 Thermit welded type conductor connectors
 - .5 Bonding jumpers, straps
 - .6 Pressure wire connectors

Part 3 Execution

3.1 INSTALLATION GENERAL

- .1 Install complete permanent, continuous, system and circuit, grounding systems including electrodes, conductors, connectors and accessories to conform to requirements of local authority having jurisdiction over installation.
- .2 Install connectors to manufacturer's instructions.
- .3 Protect exposed grounding conductors from mechanical injury.
- .4 Make buried connections using copper welding by thermit process.
- .5 Use mechanical connectors for grounding connections to equipment provided with lugs. Soldered joints not permitted.

- .6 The main public metallic water service to a building shall be utilized as the main ground electrode. Where such a service does not exist, then an artificial grounding electrode shall be provided to suit the requirements of the local inspection authorities.
- .7 Install bonding wire for flexible conduit, connected to both ends to grounding bushing, solderless lug, clamp or cup washer and screw. Neatly cleat bonding wire to exterior of flexible conduit.
- .8 Make grounding connections in radial configuration only, with connections terminating at single grounding point. Avoid loop connections.
- .9 Bond single conductor, metallic armoured cables to cabinet at supply end, and provide non-metallic entry plate at load end and run separate ground conductor.
- .10 Provide separate ground conductors in PVC conduit, plastic or fibreglass raceways.

3.2 SYSTEM AND CIRCUIT GROUNDING

- .1 Install system and circuit grounding connections to neutral points of 600V and 208V systems.

3.3 EQUIPMENT GROUNDING

- .1 Install grounding connections to typical equipment included in, but not necessarily limited to: service equipment, transformers, frame of motors, motor control centres, starters, control panels, building steel work, generators, elevators distribution panels, outdoor lighting.

3.4 COMMUNICATION SYSTEMS

- .1 Install grounding connections for telephone, sound, fire alarm, intercommunication systems as follows:
 - .1 Provide minimum #6 AWG ground from voice/data rooms to main building ground as indicated.
 - .2 Sound, fire alarm, intercommunication system, as indicated.
 - .3 All communication cable tray shall be grounded.

3.5 TESTS

- .1 Perform ground continuity and resistance tests using method appropriate to site conditions and to approval of the local inspection authority. A report shall be submitted to the Consultant from the testing agency.
- .2 Perform tests before energizing electrical system.
- .3 Disconnect ground fault indicator, if provided, during tests.
- .4 A ground electrode with an unsatisfactory resistance test result shall be altered as necessary until the required resistance reading is achieved.

END OF SECTION

Part 1 General

1.1 RELATED WORK

- .1 Section 26 00 10 – Basic Electrical Materials and Methods
- .2 Section 26 05 19 – Wire and Cable
- .3 Section 26 05 34 – Conduit, Conduit Fastenings and Conduit Fittings
- .4 Section 27 05 30 – Communication Raceways

Part 2 Products

2.1 SUPPORT CHANNELS

- .1 U-shape galvanized steel uni-strut, size 1.6" x 1.6" (40 x 40mm), 0.1" (2.5mm) thick, surface-mounted, suspended or set in poured concrete walls and ceilings as required.
- .2 Fasteners, supports and devices to be of the galvanized type.

2.2 MANUFACTURERS

- .1 Acceptable manufacturers: Burndy, Electrovert, Unistrut, Pilgrim, Pursley.

Part 3 Execution

3.1 INSTALLATION

- .1 Secure equipment to solid masonry, tile and plaster surfaces with lead anchors or nylon shields.
- .2 Secure equipment to poured concrete with cast-in or expandable inserts.
- .3 Secure equipment to hollow masonry walls or suspended ceilings with toggle bolts.
- .4 Secure surface-mounted equipment with twist clip fasteners to inverted T-bar ceilings. Ensure that T-bars are adequately supported to carry weight of equipment specified before installation. Provide additional support where required.
- .5 Support equipment, conduit or cables on support channels using clips, spring-loaded bolts, cable clamps designed as accessories to basic channel members.
- .6 Fasten exposed conduit or cables to building construction or support system using straps.
 - .1 One-hole steel straps to secure surface conduits and cables 1 ¼" (32mm) and smaller.
 - .2 Two-hole steel straps for conduits and cables larger than 1 ¼" (32mm).
 - .3 Beam clamps to secure conduit to exposed steel work.

-
- .7 Suspended support systems.
 - .1 Support individual cable or conduit runs with ¼" (6mm) dia. Threaded rods and spring clips.
 - .2 Support 2 or more cables or conduits on channels supported by 3/8" (10mm) diameter threaded rod hangers where direct fastenings to building construction is impractical.
 - .8 For surface-mounting of two or more conduits use channels at 60" (1.52m) o.c.
 - .9 Provide metal brackets, frames, hangers, clamps and related types of support structures where indicated or as required to support conduit and cable runs.
 - .10 Ensure adequate support for raceways and cables dripped vertically to equipment where there is no wall support.
 - .11 Do not use wire lashing or perforated pipe straps to support or secure raceways or cables.
 - .12 Do not use supports or equipment installed for other trades for conduit or cable support except when otherwise approved by the Consultant.
 - .13 Install fastenings and supports as required for each type of equipment cables and conduits, in accordance with manufacturer's installation recommendations.
 - .14 Where conduit and cable runs are installed on support systems, they shall be run so as to be as inconspicuous as possible. Coordinate support system path with equipment, of other trades, to ensure proper installation of electrical equipment. Run support system path perpendicular or parallel to building lines.

END OF SECTION

Part 1 General

1.1 REFERENCES

- .1 Canadian Standards Association (CSA International)
 - .1 CSA C22.1-06, Canadian Electrical Code, Part 1, 20th Edition.

1.2 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Provide submittals in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Submit samples for floor box in accordance with Section 01 33 00 - Submittal Procedures.

1.3 DELIVERY, STORAGE AND HANDLING

- .1 Deliver, store and handle materials in accordance with Section 01 61 00 - Common Product Requirements.

Part 2 Products

2.1 OUTLET AND CONDUIT BOXES GENERAL

- .1 Size boxes in accordance with CSA C22.1.
- .2 102 mm square or larger outlet boxes as required.
- .3 Gang boxes where wiring devices are grouped.
- .4 Blank cover plates for boxes without wiring devices.

2.2 SHEET STEEL OUTLET BOXES

- .1 Electro-galvanized steel device boxes for flush installation, minimum size 4" (100mm) square with extension and plaster rings, as required.
- .2 Electro-galvanized steel utility boxes for outlets connected to surface-mounted EMT conduit.
- .3 4" (100mm) square or octagonal outlet boxes for lighting fixture outlets.
- .4 4" (100mm) square outlet boxes with extension and plaster rings flush-mounting devices in finished plaster and tile walls.

Part 3 Execution

3.1 INSTALLATION

- .1 Support boxes independently of connecting conduits.
- .2 Fill boxes with paper, sponges or foam or similar approved material to prevent entry of debris during construction. Remove upon completion of work.

- .3 For flush installations mount outlets flush with finished wall using plaster rings to permit wall finish to come within 6 mm of opening.
- .4 Provide correct size of openings in boxes for conduit, mineral insulated and armoured cable connections. Do not install reducing washers.
- .5 Vacuum clean interior of outlet boxes before installation of wiring devices.
- .6 Identify systems for outlet boxes as required.

END OF SECTION

Part 1 General

1.1 RELATED REQUIREMENTS

- .1 Section 26 00 10 – Basic Electrical and Methods

1.2 REFERENCES

- .1 Canadian Standards Association (CSA International)
 - .1 CAN/CSA C22.2 No. 18-98(R2003), Outlet Boxes, Conduit Boxes, Fittings and Associated Hardware, A National Standard of Canada.
 - .2 CSA C22.2 No. 45-M1981(R2003), Rigid Metal Conduit.
 - .3 CSA C22.2 No. 83-M1985(R2003), Electrical Metallic Tubing.

1.3 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Provide submittals in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Product data: submit manufacturer's printed product literature, specifications and datasheets.
 - .1 Submit cable manufacturing data.

Part 2 Products

2.1 CONDUITS

- .1 Rigid metal conduit: to CSA C22.2 No. 45, hot dipped galvanized steel threaded.
- .2 Epoxy coated conduit: to CSA C22.2 No. 45, with zinc coating and corrosion resistant epoxy finish inside and outside.
- .3 Electrical metallic tubing (EMT): to CSA C22.2 No. 83, with couplings with.

2.2 CONDUIT FASTENINGS

- .1 One hole steel straps to secure surface conduits 50 mm and smaller.
 - .1 Two hole steel straps for conduits larger than 50 mm.
- .2 Beam clamps to secure conduits to exposed steel work.
- .3 Channel type supports for two or more conduits at 1500 mm on centre.
- .4 Threaded rods, 6 mm diameter, to support suspended channels.

2.3 CONDUIT FITTINGS

- .1 Fittings: to CAN/CSA C22.2 No. 18, manufactured for use with conduit specified.
Coating: same as conduit.
- .2 Ensure factory "ells" where 90 degrees bends for 25 mm and larger conduits.

2.4 FISH CORD

- .1 Polypropylene.

Part 3 Execution

3.1 MANUFACTURER'S INSTRUCTIONS

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

3.2 INSTALLATION

- .1 Install conduits to conserve headroom in exposed locations and cause minimum interference in spaces through which they pass.
- .2 Conceal conduits except in unfinished areas.
- .3 Surface mount conduits.
- .4 Use rigid hot dipped galvanized steel threaded conduit except where specified otherwise.
- .5 Minimum conduit size for lighting and power circuits: 21 mm.
- .6 Bend conduit cold:
 - .1 Replace conduit if kinked or flattened more than 1/10th of its original diameter.
- .7 Mechanically bend steel conduit over 19 mm diameter.
- .8 Field threads on rigid conduit must be of sufficient length to draw conduits up tight.
- .9 Install fish cord in empty conduits.
- .10 Remove and replace blocked conduit sections.
 - .1 Do not use liquids to clean out conduits.
- .11 All wiring in finished areas shall be concealed. Conduits shall be run at right angles to the building lines.
- .12 Conduit and wiring shall be grouped where possible and clipped in a neat and workmanlike manner.
- .13 AC-90 cable to be used for drops from conduit systems to recessed lighting fixtures in accessible ceilings or outlet boxes in steel stud walls only. Home runs shall be in conduit. Maximum run of AC-90 in accessible ceiling space shall be 1.5M.
- .14 The use of electrical non-metallic tubing (ENT) shall be limited to in-slab installations only.

3.3 SURFACE CONDUITS

- .1 Run parallel or perpendicular to building lines.
- .2 Locate conduits behind infrared or gas fired heaters with 1.5 m clearance.

- .3 Run conduits in flanged portion of structural steel.
- .4 Group conduits wherever possible on suspended channels.
- .5 Do not pass conduits through structural members except as indicated.
- .6 Do not locate conduits less than 75 mm parallel to steam or hot water lines with minimum of 25 mm at crossovers.

3.4 CONCEALED CONDUITS

- .1 Run parallel or perpendicular to building lines.
- .2 Do not install conduits in terrazzo or concrete toppings.

END OF SECTION

Part 1 General

1.1 RELATED WORK

- .1 Section 26 00 10 – Basic Electrical and Methods
- .2 Section 26 05 32 – Outlet Boxes, Conduit Boxes and Fittings

1.2 SUBMITTALS

- .1 Drawings shall include electrical detail of panel, branch breaker type, quantity, ampacity and enclosure dimension.

Part 2 Products

2.1 PANELBOARDS

- .1 Panel boards are existing and shall be utilized to feed new layout.
- .2 Provide new breakers to match the existing panelboards as required by the design.

Part 3 Execution

3.1 INSTALLATION

- .1 Revise the directory in existing panels to suit revised circuiting (typewritten). Place existing directory behind new directory for verification by Consultant.

END OF SECTION

Part 1 General

1.1 RELATED WORK

- .1 Section 26 00 10 – Basic Electrical Materials and Methods
- .2 Section 26 05 32 – Outlet Boxes, Conduit Boxes and Fittings

1.2 SUBMITTALS

- .1 Submit shop drawings and product data in accordance with Section 26 05 00.

Part 2 Products

2.1 SWITCHES

- .1 Toggle-operated general purpose AC switches 15A and 20A, 120V AC and 347V AC, single pole, double pole, three-way and four-way switches as indicated, with the following features:
 - .1 Terminal holes approved for No. 10 AWG wire.
 - .2 Silver alloy contacts.
 - .3 Urea molding.
 - .4 Suitable for back and side wiring.
 - .5 Brown or white toggle as indicated.
 - .6 Fully rated for tungsten filament and fluorescent lamps, and up to 80% of rated capacity of motor loads.
- .2 Switches of one manufacturer throughout project.
- .3 Switches shall be premium specification grade (Industrial spec grade or Commercial grade).
- .4 Acceptable Manufacturers:

<u>Manufacturer</u>	<u>120 Volt</u>	<u>347 Volt</u>
Hubbell	1200 Series	18200 Series
Leviton	1200 Series	54500 Series
Pass & Seymour	15AC1 Series	3715 Series
Copper Wiring Devices	1200 Series	18201 Series

2.2 RECEPTACLES

- .1 Duplex receptacles, NEMA No. 5-15R, 125V AC, 15A, U-ground with the following features:
 - .1 Nylon face. Confirm colour with Architect, Interior Designer or Consultant.

- .2 Suitable for No. 10 AWG for back and side wiring.
- .3 Break-off links for use as split receptacles.
- .4 Triple wipe contacts and riveted grounding contacts.
Cooper Wiring Devices: BR Series – Commercial Grade #5252 Industrial Grade –
5 wire contacts, terminal covers, one piece grounding system.
- .2 Single receptacles NEMA No. 5-15R, 125V AC, 15A, U-ground, with the following features:
 - .1 Nylon face. Confirm colour with Architect, Interior Designer or Consultant.
 - .2 Suitable for No. 10 AWG for back and side wiring.
 - .3 Receptacles shall be identified isolated ground type where indicated either by orange colour face or orange triangle. Confirm option with Architect, Interior Designer or Consultant. Provide a separate insulated ground wire for each isolated ground circuit.
 - .4 Receptacles shall be of one manufacturer throughout project.
 - .5 Acceptable Manufacturers: Hubbell, Copper Wiring Devices, Bryant, Woodhead, Pass & Seymour. Catalogue No. 5252 for all manufacturers.

2.3 SPECIAL WIRING DEVICES

- .1 Special wiring devices: as indicated on drawings.
- .2 Pushbutton stations shall be flush or surface-mounted as required. Units shall be complete with up/down, or start/stop buttons, as required and green pilot light.

2.4 OCCUPANCY SENSORS

- .1 Switches shall be totally enclosed in moulded housing, 15AC1 or 20AC1 series, 15 amps or 20 amps, 125 VAC as indicated equal to Hubbell No. 1201, P & S No. 15AC1, or Bryant No. 4801.
- .2 Ceiling mounted motion sensors shall be equal to Watt Stopper DT- 355.
- .3 Wall mounted motion/manual vacancy sensor shall be equal to Leviton single pole and 3-way IPV15-ILZ.
- .4 Wall mounted motion/manual vacancy sensor and dimmer equal to Leviton single pole and 3-way IPVD6-ILZ.
- .5 Hard wired dimmable LED luminaires shall be provided with 0-10V driver with compatible dimmer control. Approved dimmers are Lutron or Leviton.
- .6 Provide a dedicated neutral for all electronic dimming and driver controls.
- .7 Provide line voltage and control wiring in independent conduit systems as necessary for operational systems. Refer to Manufacturer's wiring diagrams.

2.5 COVERPLATES

-
- .1 Coverplates from one manufacturer throughout project.
 - .2 Stainless steel coverplates for wiring devices mounted in flush-mounted outlet boxes.
 - .3 Sheet steel utility box cover for wiring devices installed in surface mounted utility boxes.
 - .4 Cast gasketed coverplates for wiring devices mounted in surface mounted FS or FD-type conduit boxes.
 - .5 Weatherproof double lift spring-loaded cast aluminium coverplates, complete with gaskets for duplex receptacles as indicated.
 - .6 Weatherproof coverplates, complete with gaskets for single receptacles or switches as indicated.

Part 2 Execution**2.1 INSTALLATION – SWITCHES**

- .1 Install single throw switches with handle in “UP” position when switch closed.
- .2 Install switches in gang-type outlet box when more than one switch is required in one location.
- .3 Mount toggle switches at height specified in Section 26 05 00 or as indicated.

2.2 INSTALLATION – RECEPTACLES

- .1 Install receptacles in gang-type outlet box when more than one receptacle is required in one location.
- .2 Mount receptacles horizontally at height specified in Section 26 05 00, or as indicated.
- .3 Install cord sets on ranges and dryers.

2.3 INSTALLATION – COVERPLATES

- .1 Install suitable common coverplates where wiring devices are ganged.
- .2 Do not use coverplates intended for flush outlet boxes on surface mounted boxes.
- .3 Provide a coverplate on each outlet.

2.4 IDENTIFICATION

- .1 Identify receptacles with size Ø nameplate indicating panel and circuit number. Nameplates to be pre-glued with peel-off paper backing.

END OF SECTION

Part 1 General

1.1 RELATED WORK

- .1 Section 26 00 10 – Basic Electrical Materials and Methods
- .2 Section 26 05 32 – Outlet Boxes, Conduit Boxes and Fittings

1.2 SUBMITTALS

- .1 Submit complete photometric data prepared by an independent testing laboratory for luminaires where specified for approval by Consultant.
- .2 Submit shop drawings and product data in accordance with Section 26 00 10. Shop drawings shall include luminaire lamp type, ballast and/or driver data including manufacturer name and model number, for each luminaire type. Include total luminaire power consumption including ballast and/or driver losses, voltage, base type, and order codes. Lamp data shall include color temperature, and CRI.
- .3 Maintenance manuals shall include a list of replacement lamps, ballasts and/or drivers for each luminaire. Include manufacturer data including name and model number, lamp type. Voltage, wattage, base type and order code. Lamp data shall include color temperature and CRI.

1.3 GUARANTEE

- .1 Replace:
 - .1 Replace fail drivers within a year with acceptable driver.

1.4 COORDINATION

- .1 Coordinate luminaire locations with work of other trades.
- .2 Coordinate luminaire types with ceiling finishes to ensure compatibility.

Part 2 Products

2.1 GENERAL

- .1 Luminaires shall carry the CSA label.
- .2 Provide supporting devices, plaster frames, junction boxes and outlet boxes where required.
- .3 Include finishes to Section 26 00 10 and as indicated.

2.2 LED LIGHTING

- .1 All LED lighting shall have the following I.E.S. testing to be considered for installation.
 - .1 LM 80 08 Approved methods measuring lumen maintenance for SSL light sources.

- .2 LM 79 08 Approved methods for electrical photo and metric measurements of solid state lighting products.

- .2 All LED lamps and drivers shall have minimum 5 year warranty with minimal hours of operation of 50,000 hours or equal to luminaires hours.

Part 3 Execution

3.1 INSTALLATION (LUMINAIRES)

- .1 Install luminaires at locations indicated, complete with all wiring, connections, fittings, hangers, aligners, box covers and accessories, as required.
- .2 Install luminaires and lens materials in architectural details, as indicated.
- .3 Install luminaires parallel with building lines. Wall-mounted luminaires shall be installed plumb.
- .4 Review all ceiling type, construction details and mounting arrangements before placing luminaire orders and ensure that all mounting assemblies, frames, rings and similar features are included for and match the required installation.
- .5 All luminaires and assemblies shall be properly secured and supported. Support luminaires independent of the ceiling construction, complete with all fasteners, framing and hangers, as may be required. Do not secure luminaires to mechanical ductwork or other vibration producing apparatus, unless specifically detailed on the drawings.
- .6 Where a luminaire is suspended from the ceiling using a self-aligning box cover, an additional ground wire from the outlet box to the luminaire shall be provided.
- .7 Coordinate the installation of luminaires with the work of other trades, ensuring that the necessary depths and mounting spaces are provided. Luminaires which cannot be installed due to a conflict with structural members, pipes or ductwork shall be relocated to a more suitable location, as directed by the Consultant and/or Architect.

3.2 WIRING

- .1 Connect luminaires to lighting circuits as indicated.
- .2 Provide dedicated neutral for all dimmable fixtures

3.3 LAMPS

- .1 Adjust lamp position in adjustable lamp holder-type luminaires to produce the proper beam distribution for the specified lamp.

3.4 TESTS

- .1 Perform tests in accordance with Section 26 00 10.
- .2 Check luminaires and replace defective drivers and accessories.

3.5 CLEANING

-
- .1 Prior to take-over of the project, clean the lenses and reflectors of all luminaires with a damp cloth to remove dust, smudges and fingerprints.

END OF SECTION

Part 1 General

1.1 RELATED WORK

- .1 Section 26 05 00 – Common Work Results - Electrical
- .2 Section 26 05 21 – Wire and Cable
- .3 Section 26 05 34 – Conduit, Conduit Fastenings, and Conduit Fittings.
- .4 Section 26 05 32 – Outlet Boxes, Conduit Boxes and Fittings.

1.2 REFERENCE STANDARDS

- .1 Manitoba Building Code.
- .2 ULC S524: Installation Standards.
- .3 ULC S525: Audible Signal Devices.
- .4 ULC S528: Manual Pullstations.
- .5 ULC S530: Thermal Detectors.
- .6 ULC S529: Smoke Detectors.

1.3 SUBMITTALS

- .1 Submit shop drawings in accordance with Section 26 05 00.
- .2 Submit the following manuals:
 - .1 Equipment Information Manual.
 - .2 Operations Manual.
 - .3 Maintenance Manual.
 - .4 Each manual shall describe in a clear, concise manner the operational characteristics of all system components.

1.4 OPERATION AND MAINTENANCE DATA

- .1 Provide data for incorporation into Maintenance Manual specified in Section 26 05 00.
- .2 Operation and Maintenance Manual to include:
 - .1 Operation and maintenance instructions for complete fire alarm system to permit effective operation and maintenance.
 - .2 Technical data- illustrated parts lists with parts catalogue numbers.
 - .3 Copy of approved shop drawings.

1.5 MAINTENANCE MATERIALS

- .1 Provide maintenance materials in accordance with Section 26 05 00.
- .2 Include:
 - .1 Ten spare plastic break rods for manual pullstations.
 - .2 Ten spare lamps for main control panel.

1.6 MAINTENANCE

- .1 Provide one year's free maintenance with two inspections by manufacturer during the first year of service. Submit Inspection Report to Owner and Consultant.

1.7 SERVICE

- .1 The supplier of the system must employ factory-trained technicians and maintain a service organization within driving distance of the jobsite.

1.8 WARRANTY

- .1 The system shall carry a one year warranty from date of acceptance by Owner.

1.9 SYSTEM DESCRIPTION

- .1 The Electrical Subcontractor shall install new devices or relocate existing as indicated on the drawings. All audible, alarm or supervisory zones that have been altered or added to shall be reverified by an agent acceptable to the Consultant. The cost of this reverification shall be included in the contract price.
- .2 The Reverification Report shall accompany the record drawings.
- .3 Provide written confirmation of monitoring or Schedule A with City of Winnipeg, where required.
- .4 All new fire alarm devices shall match existing.
- .5 Where fire alarm devices are deleted, provide red coverplate and ensure continued accessibility. Paint coverplates of all fire alarm junction boxes, this area red.
- .6 All new and/or relocated fire alarm devices shall be listed and locations shown on a separate drawing to be issued to Building Owner.
- .7 Provide separate zone where new fire wall shown and connect to new zone on existing system.

Part 2 Products

2.1 FIRE ALARM DEVICES

- .1 Provide new devices to match existing system.

2.2 WIRING

- .1 The fire alarm system wiring shall be installed in a separate and independent conduit system. All equipment wiring shall be in accordance with the manufacturer's specifications and connections shall be strictly as shown in the manufacturer's installation instructions.
- .2 Manual stations, automatic detectors, bells, sprinkler flow switches, etc., shall be wired and connected to their respective zone monitor point terminals in the main control panel with #14 AWG conductors (R90) or multi-conductor #18 power limited fire protective 105°C (221°F) cable. Each zone shall end with an E.O.L resistor. The zoning and circuiting of the devices shall be as shown on the drawings. Provide connection to all flow and tamper switches as shown on mechanical and electrical drawings.
- .3 All control wiring for fan shutdowns, damper controls, etc., shall be wired with #14 AWG (R90) conductors.
- .4 Fire detectors shall be mounted a minimum of 900 mm from an air supply outlet or 600 mm from an air exhaust outlet.

Part 3 Execution

3.1 GENERAL

- .1 Locate, install, wire and connect all components and devices in accordance with the requirements of the manufacturer and ULC S524.

3.2 MOUNTING OF EQUIPMENT

- .1 Mount equipment at heights as described in Section 26 05 00.
- .2 Mount equipment square and plumb with building lines. Install devices flush and square with finished surfaces.

3.3 TERMINATION OF CONDUCTORS

- .1 Terminate conductors directly to the terminals of each device. Splices at pigtail-types of connections are not permitted.

3.4 IDENTIFICATION

- .1 Identify equipment as per Section 26 05 00.
- .2 Clearly identify zones on control panels, devices, etc.
- .3 Identify wires and cables with wire markers to indicate box circuit numbers and terminals, signal circuit numbers and terminals, annunciator wiring. Identify wiring in each box, panel, cabinet, etc. Coding of identification to meet the approval of the Consultant.

3.5 TESTING

- .1 Conduct tests as per Section 26 00 10.
- .2 The complete system shall be tested and verified in accordance with CAN/ULC-S537-M86, "Standard for the Verification of Fire Alarm System Installation". The manufacturer shall conduct all testing and provide necessary technical personnel. The Electrical Subcontractor to provide necessary manpower to facilitate testing.
- .3 The manufacturer shall conduct an overall examination of the system installation for the following:
 - .1 The type of equipment installed is that designated by the Consultant's specifications.
 - .2 The wiring connections to all equipment components show that the installer undertook to have observed ULC and CSA requirements.
 - .3 Equipment has been installed in accordance with the manufacturer's recommendations and that all signalling devices are operable.
 - .4 The supervisory components are operating and that regulations governing such supervisory wiring have been met to the satisfaction of inspecting authorities.
- .4 The complete system shall be tested in the presence of the Consultant, Owner's representative, and City of Winnipeg Electrical Inspector, on completion of the verification. Tests shall demonstrate that the fire alarm system will function in an acceptable manner. The Electrical Inspector shall be the final authority in determining the acceptable manner of operation.
- .5 Include all costs for setting up and testing the fire alarm system, as directed by the Consultant.

END OF SECTION